Performance Monitoring Analysis Capability V3.1 Addendum Document

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1.0 INTRODUCTION

This document provides an overview of the additional files and data sets that were recently added to the Performance Monitoring Analysis Capability (PMAC) (from 1999 to present). Record layout and field descriptions of several of the key data sources embedded in PMAC are described. Note: This document supersedes the PMAC V3.0 Addendum Document (October 2000). These data can assist analysts on a wide range of tasks during investment analyses, specifically benefits analysis, performance measurement, model validation, and general operational analysis. At this time, PMAC, which is used primarily as an internal ASD-400 data analysis tool, is resident on three PC workstations in the ORLAB: Falcon, Darwin, and Richter. Version 3.1 maintains the same functionality as the previous versions (Version 2.0 and Version 3.0) through an enhanced Graphical User Interface (GUI) with additional files and features, as well as the existing files developed previously. Note: Very minimal development or extension of PMAC's GUI has been expended over the past couple years. Also, since the current Database Management System (DBMS) format has not been updated to the most current FoxPro Version - V6.0, all files are being saved so they are backward compatible with FoxPro V2.6 database format.

PMAC V2.0 Manual (October 1997) provides a listing of several of the files with their data sources that were previously used (with short descriptions) and remain (for the most part) in the current version of PMAC. Furthermore, the V2.0 manual provides a more comprehensive discussion of the many essential components that constitute the tool.

2.0 VERSION 3.0 AND 3.1 ENHANCEMENTS

Listed below are the more noteworthy enhancements that have been incorporated into the most recent PMAC upgrades. Enhancements 1 through 8 are Version 3.0 updates; enhancements 9 through 13 are Version 3.1 updates. Sample views and more detailed illustrations of each enhancement follow in Section 5.0.

1. Monthly and daily summaries from the Airline Service Quality Performance (ASQP)[1] data (airborne times, actual block times, and arrival delays, etc.) beginning in January 1995. The data views include both specific airport performance and National Airspace System (NAS) performance for each day since 1995. *(Filenames[2]: APTYYMMR, APTYYR, NASYYR, and NASYYMMR)* In addition, these summaries were prepared by only including flights between a common set of over 3400 common city pairs for each year. *(Filenames: APPTYYO, APTYYMMO, NASYYO, and NASYYMMO)*

[1] The 10 reporting carriers from 1995 to present are: Alaska Airlines, American Airlines, America West, Continental Airlines, Delta Airlines, Northwest Airlines, Southwest Airlines, Trans World Airlines, United Airlines, and US Air. In 2001, two additional other carriers, Aloha and American Eagle, began reporting to DOT.

[2] All filenames listed in the each of the enhancements are in .dbf format, which are easily convertible into text formats.

2. Summaries of actual per flight taxi-in and taxi-out times from the ASQP. Previously, only taxi delay, which was based on an actual taxi time minus a calculated unimpeded taxi time, (per the Office of Aviation Policy and Plans (APO) -130) was shown. Also, views in the taxi time trends from 1995 through 2002 at the busiest airports are available. *(Filenames: TOACTYY, TINACTYY, and TAXISUMM)*

3. Summary tables (1998 to 2000) from the Consolidated Operations Delay Analysis System (CODAS) and the Aviation System Performance Metrics (ASPM) (2001 to present) for several of the busiest city pairs in the NAS. These tables include average scheduled and actual block times, airborne times, and filed and planned en route times. *(Filename: 1998-2000 – CDSUYYMM; 2001-present AMSUYMM)*

4. Airport Direct Operating Costs (ADOC) with both airborne and block hour, which includes crew, fuel and oil, maintenance, and depreciation costs of air carrier, airfreight, air taxi, general aviation, and military category aircraft. These costs are based on carrier submitted Form 41 and 298-c reports that have been aggregated into an APO policy document. The costs are adjusted to reflect the Office of Management and Budget (OMB) inflation factors. *(Filename: ADOC)*

5. Annual, monthly, and daily diversion and cancellation files. These files are based on scheduled flights reported by the 10-12 carriers that report to Department of Transportation (DOT) that are reflected in the ASQP. *(Filenames: CXLYYMM, CXLYYTOT, DIVYYMM, and DIVYYTOT)*

6. Additional weather fields are available. The files now contain elements of precipitation (i.e., thunderstorms, hail, mist, rain, snow, etc.). Additionally, there are weather codes associated with each reported weather event for almost 500 NAS airports beginning in 1999. (For a more detailed discussion, see the documentation in the "Overview of Weather Data Maintained by ASD-400.") *(Filename: WXYYMM)*

7. Airport capacity updates were performed in the "2000 Airport Capacity Survey" (a survey supported by Air Traffic Procedures Division (ATP-100) and carried forward by ASD-400). The current capacities are based on actual responses, and the future capacities are based on estimates of the most recent runway improvements (per the Airport Capacity Office and planned Communications, Navigation, and Surveillance/Air Traffic Management (CNS/ATM) enhancements that are identified in the NAS Architecture). Capacity projections for 2005 and 2010 scenarios are built from the baseline 2000 values. *(Filenames: cap_db_rev9.mdb and Future Caps 2000 rev 6.xls)*

8. City pair scheduled flight time bands from the Official Airline Guide (OAG) are identified for each year. Three percentiles (the 15^{th}, 25^{th}, and 50^{th}) are presented for the month of October from 1995 through 2002. *(Filename: FLT_TMYY)*

9. A file providing the number of seats by aircraft type was developed using the OAG data. This file is very useful for deriving enplanements to/from an airport when calculating the passenger value of time costs for any set of airports. (*Filename: AC_SEATS*)

10. This enhancement provides fuel burn and trajectory rate performance data for 71 aircraft types. The file presents values during climb, cruise, and descent phases of the flight. (*Filename: BADA)*

11. Data sets that map the relationship between surface weather observations and scheduled arrival times were developed for 1999 through the present using ASQP and NCDC surface operations data. (*Filenames: WXDYYAMO, WXDYYAPT, WXDYYMO, WXDYYSUM*)

12. This data set contains records of all reported thunderstorms. Each record contains the duration (in minutes) of each thunderstorm at the impacted airport. (*Filename: WXTSTMYY*)
13. Turnaround times from all airports that are in the ASPM are computed. The times are developed tracking the difference in the arrival time and the departure time of the next flight leg for the same aircraft, identified by tail number, airport, carrier, and aircraft type. They are derived for each airport, carrier, and aircraft type by each season of the respective year. (*Filename: TTIMYYMM*)

3.0 PMAC APPLICATIONS

PMAC offers a wide range of capabilities when conducting analysis. These include addressing the following sample questions:

- What are the historical delay averages by phase of flight from an individual airport and system perspective? Where and when can the problems be isolated? Are these delays consistent with the planned acquisitions that are intended to reduce delays at selected airports?
- How are airport/airspace improvement programs, new procedures, etc., impacting the NAS in the form of delays and flight efficiency? What is the historical five-year trend in delays and block times?
- What city pairs show the largest flight delays, and differences between scheduled and actual flight times? When do delays occur at different airports? What has been the rate of change over the past five years?
- What additional insights into understanding future trends and problems in the system can be obtained from analyzing taxi-in and taxi-out delays (i.e., evaluate the capacity-to-demand relationship to delay)?
- Where, when, and how often are the reported cancellations and diversions reported in the NAS?
- What are the seasonal and time-of-day frequencies of Visual Flight Rule (VFR), non-precision, and Category (CAT) I/II/III weather at given airports based on several years of historical data?
- What is the fleet mix (sequence of heavy, large, 757, and small aircraft) and air carrier mix at each airport?

Similarly, sample uses of PMAC include the following:

- Identify a system outage from National Airspace Performance Reporting System (NAPRS) performance, Air Traffic's Operations Network (OPSNET), or AFTECHNET reports. Relate outages to delays, cancellations, and diversions for impacted city pairs by time of day.
- Provide supporting hourly demand, as well as current and projected future airport capacity inputs at the 38 airports in ASD-400's System Outage Disruption Model (SODM).
- Provide supporting data for the development and verification of the assertions being made when reviewing Mission Need Statements (MNSs).

- Query reference data such as runways by airports, aircraft attributes, carriers by airport, future NAS trends, and airport codes.
- View summary delay and demand data for a given month to measure/quantify the impact of acquisition decisions on airport performance.
- Examine the flight time ranges (low to high) of city pairs to assess the efficiency of the system and to provide better insight of how the airlines develop and manage block times to ensure a high level of on-time performance. This tool can be a good reference for baselining the benefits that claim increased "flight efficiency."
- Capture taxi-time distributions for major airports. Compare the performance between years during peak departure and arrival times.
- View an airport's historical, current, and future enplanement and operations of air carriers, air taxi, general aviation, and military flights.
- Map National Climatic Data Center (NCDC) surface weather data with each airport's delays, demand, weather, capacity, etc. Quantify the impact of CAT I/II/III conditions and thunderstorms on an airport's effectiveness.
- Quantify outcome measures and performance indicators in the capacity mission area. This can support the Government Performance Results Act (GPRA) performance metrics initiatives.
- Conduct post-implementation analysis for key program and/or NAS metrics (e.g., ATO and OEP metrics).

4.0 DATA SOURCES

Figure 1 illustrates several data sources that form the backbone[3] of PMAC. An overview of all of the data sources in the figure (with short descriptions) is presented in Appendix A.

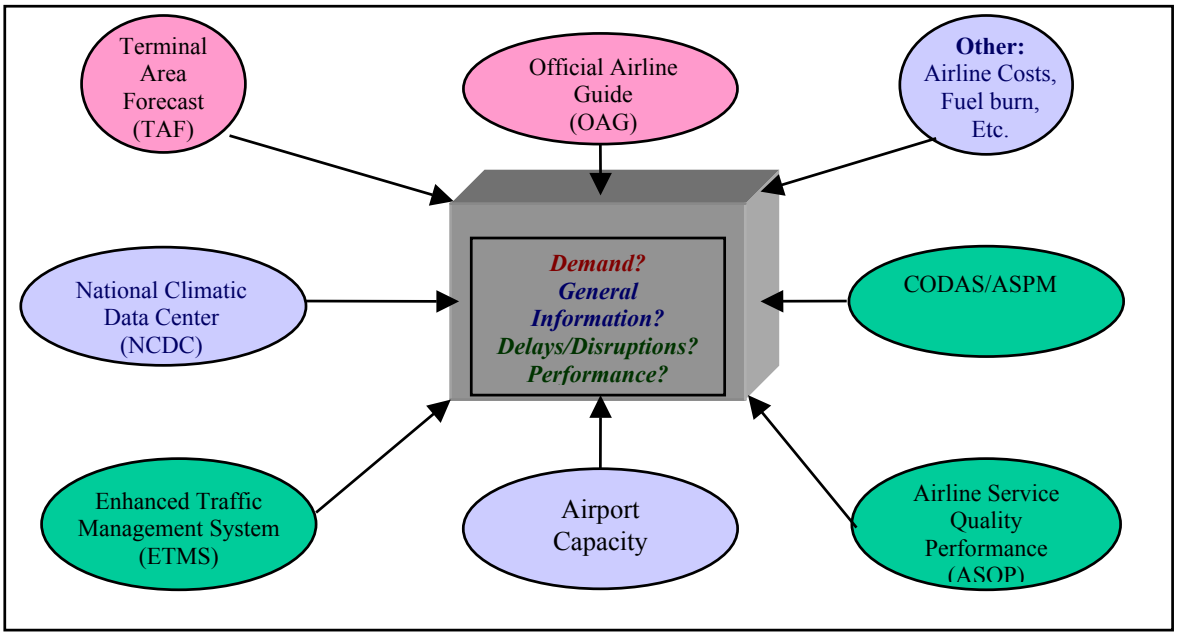

Figure 1. Current PMAC Configuration

Record layouts with concise data descriptions are presented in Appendices B through H.

- List of Database Files in PMAC - (Appendix A)
- Official Airline Guide - (Appendix B)
- Airline Service Quality Performance (ASQP) - (Appendix C)
- Consolidated Operations and Delay Analysis System (CODAS) - (Appendix D)
- Aviation System Performance Metrics (ASPM) - (Appendix E)
- Enhanced Traffic Management System (ETMS) - (Appendix F)
- Terminal Area Forecast - (Appendix G)
- NCDC Hourly Surface Weather Observations - (Appendix H)

(For a more detailed discussion of the NCDC weather in ASD-400, see the supplementary weather document, *Overview of Weather Data Maintained by ASD-400*, dated September 2001, updated December 2002.)

[3] The ETMS, CODAS, and ASPM are not directly retrievable through PMAC. Their data complements much of the analysis that PMAC is intended to perform.

Table 1 below provides a summary of the accessible PMAC data from 1995 through present. An "**X**" indicates that data is available for each day in the respective year; an "**XO**" indicates that the data is available from ad-hoc requests through the respective organizations; and an "**O**" indicates that the data will be available in the future. A "blank" indicates that the data is not available for the respective year. The shaded area in the CODAS row displays no further years will be obtained; ASPM replaced it in 2001. OAG, ASQP, CODAS, and NCDC surface weather data extracts are accessible directly through PMAC.

Table 1. Primary Accessible Data

	Year							
Source	1995	1996	1997	1998	1999	2000	2001	2002
1) OAG	X	X	X	X	X	X	X	X
2) ASQP	X	X	X	X	X	X	X	X
3) CODAS[4]				X	X	X		
4) ETMS[5]				XO	XO	XO	XO	XO
5) NCDC Surface Weather	X	X	X	X	X	X	X	X
6) ASPM							X	X
7) Other[6]					X	X	X	X

Several ETMS tables, raw CODAS, and ASPM data sets that are provided by to ASD-400 to APO-130 can be accessed outside of the PMAC tool on any workstation in the ORLAB. The ETMS, which is provided on an ad-hoc basis by ATA-200, can be accessed from the Jupiter\Friday\Data\ETMS\respective year, e.g., 2002, sub-directory on the Friday FTP server (Wrongway.Orlab.FAA.GOV, IP address: 192.151.100.39). Each user requires a password and login ID from the ASD-400 network administrator. Over 200 days of ETMS data are currently available in four different tables: arrival messages (az), departure messages (dz), target messages (tz), and flight plan messages (fz). The processed CODAS files, which are converted from the raw files in Julian seconds (provided by APO) to GMT time, then to local time are also available from the network storage data drives.

The "Other" category applies to data sets such as the most recent Terminal Area Forecast (TAF) (December 2001 update), future airport capacities, and the most recent climatological data provided by the NCDC. These data currently reside on the Tweedledee sub-directory in both the shared and local directories. (See Appendix A for a list of the processed FoxPro data files (*.dbf format) used for accessing the menus and sub-menus in PMAC.)

[4] Processing for all the airports that comprise the CODAS ended in December 2000. Beginning in 2001, CODAS was replaced with ASPM, which has data on all flights to/from 49 airports. A record layout and description of ASPM is presented in Appendix E.

[5] At the completion time of the report, ASD-400 had the capability of evaluating selected fields for over 200 days (from 1998 through 2002) for these files. The data is available from ATA-200 on an ad-hoc basis.

[6] This category includes: 1) the TAF files, 2) airport capacity information, and 3) historical Ground Delay Program (GDP-E) files that are available through the following url/web address: http://www.metsci.com/cdm/ad/gdp.html. GDP-E information (made available through the Command Center for 1995 and 1996 operations) is available upon request from ASD-400, and 4) the Base of Aircraft Data (BADA) aircraft performance information from Eurocontrol.

Table 2 lists a summary of the key attributes in the primary data sources contained in PMAC as of October 2002.

Table 2. Data Attributes

Attributes	OAG	ASQP	CODAS	ASPM	ETMS
Demand	Scheduled air carrier flights for 1) Domestic-to-International, 2) International-to-Domestic, and 3) Domestic-to-Domestic flights[7]. Includes flight status by day.	10-12 reporting air carriers to DOT who submit on-time performance reporting - airport representation is dependent on the air carriers serving a particular airport.	All domestic, commercial, and freight flights picked up from both the ARTCC host computers and the actual flights reported to DOT from 10-12 reporting carriers.	Similar to CODAS but combines all domestic, commercial, and freight flights to/from 49 major airports using time stamps from OPSNET, ETMS, ARINC, and ASQP.	All filed and as flown IFR flight plans collected from ARTCC host computers.
Delay	Not applicable, however, contains scheduled flight times which are also in ASQP and CODAS.	Captures time stamps by phase of flight (taxi and airborne phases). Also, includes pushback times, block times, and difference between schedule and actual flight times.	Combination of reported ASQP delays and estimates from ETMS arrival and departure messages for non-ASQP flights.	Combination of reported ASQP delays and estimates from ETMS arrival and departure messages for non-ASQP flights.	Based on tracking flight through time stamps from arrival (az) and departure (dz) messages.
Other	Carrier equipment type, number of days flown per flight, effective dates, and stage length.	Tail number[8] to carrier to build flight itineraries. Cancellations and diversions.	Filed and planned flight times, user class, ATC gate hold, and tail numbers.	Filed and planned flight times, user class, ATC gate hold, runway configurations, and tail numbers.	Fixes and navaids, build routes, equipage, flight plans, aircraft attributes, NRP participant, etc.
Format	ASCII or DBF processed into DBF or TXT.	ASCII text processed into DBF.	ASCII text processed into DBF.	ASCII text processed into DBF.	ASCII text from ORACLE tables processed into ASCII text files.
Size	**PMAC:** 4-8 MB per month approx. 65,000-90,000 records does not include International-to-International flights, 19 fields, including effective days, and effective and disabled dates[9]. **Raw**: 40-60 MB per month, 46 fields, approx. 200,000 records per month includes all scheduled flights worldwide.	**PMAC**: Approx 30-35 MB per month, approx. 450,000 records per month – 19 fields. **Raw:** 40-45 MB per month – 28 fields.	**PMAC:** selected fields in CODAS and ASPM used for some of the data sets. (See Appendix A) **Raw**: CODAS: 300-400 MB per month, approx 800,000-900,000 records per month, 101 fields, weather fields are not always populated. ASPM: Four file types, primary file, the flight level file has 81 fields, approximately 900,000 records per month.	**PMAC:** 23 selecfields carried over (plus 3 dummy fields), approx 1 MB per month, 6000 records. **Raw**: 150 MB per month, approx 800,000 records per month, 51 fields thru June 2002; 81 fields from June 2002 to present 300-350 MB.	Accessible outside of PMAC through the ORLAB file server: Four formats currently received from ATA-200 by ASD-400 (Sizes are in WINZIP format) az & dz – 1-1.5 MB per day – 20 fields fz – 7-11 MB per day – 44 fields tz – 30-40 MB per day– 16 fields.

[7] PMAC does not include international flights to other international destinations. These complete files are available in the Data/OAG directory maintained on the file server in the ORLAB.

[8] This field needs to be derived from the processed ASQP data. These data currently reside in the data/asqp directories in both text delimited (asqp_txt directory) and standard text formats (aqyymm_3 directory) assessed on Friday, the FTP server.

[9] Effective date, disabled date, and e-day carried over from 1997 to present.

5.0 ILLUSTRATION OF VERSION 3.0 AND 3.1 ENHANCEMENTS

Descriptions of each of the primary enhancements noted in Section 2.0 follow. Each number corresponds to the features described in Section 2.0.

1) NAS summary performance files have been generated for all operations from 1995 and beyond from the ASQP data. These files are: 1) summaries of the performance of the NAS for a given day (Tables 3 and 4), and 2) summaries of the performance at individual airports on a given day (Table 5). The following is an example of several useful values presented in each of the files.

As an illustration on 8/1/1999, the average gate-to-gate time of 14,607 flights (reported by 10 of the largest domestic carriers through the DOT) was 127.1 minutes. These flights incurred 48,108 minutes of delay or 3.3 minutes gate-to-gate (also frequently referred as block time delay) per flight[10]. Similarly, for these flights, 220,632 delay minutes were incurred with the average arrival delay (the amount of time that the aircraft actually arrived beyond its scheduled arrival time) being 15.1 minutes. The 15.1 minutes represents the amount of time, on average, that a flight arrives behind schedule, regardless of the time the flight pushed back from the gate. In this case, it appears that several flights pushed back well beyond their scheduled departure time. In contrast, on the two subsequent days (August 2nd and August 3rd), it appeared that the NAS performance was very good relative to the other days in August 1999. Furthermore, this table shows a breakdown of the distribution of the flights: 8,152/14,607 or 56 percent of the flights had arrived one or more minutes behind schedule, or 44 percent arrived on time or early.

Table 3. NAS Performance by Day (Arrival Delay Details) - Source: ASQP

Date	Airb Min	Avg Airb Min	G2G Min	Avg G2G Min	G2G Delay Min	Avg G2G Delay	Arrival Delay Min	Avg Arr Delay	# of Flts.	Arrival Delay >0 min	Arrival Delay <0 min	Arrival Delay (0-5)	Arrival Delay (6-10)	Arrival Delay (11-15)	Arrival Delay (16-30)	Arrival Delay >=30
19990801	1530718	104.8	1856482	127.1	48108	3.3	220632	15.1	14607	8152	44%	10%	11%	8%	12%	15%
19990802	1591084	103.2	1920861	124.6	41767	2.7	125225	8.1	15412	6832	56%	11%	10%	7%	8%	8%
19990803	1595949	103.5	1937812	125.7	51640	3.3	133523	8.7	15421	6691	57%	11%	10%	7%	8%	8%
19990804	1607367	104.5	1956064	127.1	65971	4.3	187779	12.2	15385	7729	50%	11%	11%	7%	10%	12%
19990805	1617058	105.2	1972043	128.3	77418	5.0	256237	16.7	15373	8496	45%	10%	11%	7%	11%	16%
19990806	1616663	104.0	1957613	125.9	49199	3.2	188436	12.1	15551	8235	47%	11%	11%	8%	11%	12%
19990807	1484008	108.0	1780988	129.6	41640	3.0	158018	11.5	13746	6717	51%	11%	10%	7%	10%	11%
19990808	1579379	106.3	1905361	128.2	56505	3.8	233936	15.7	14859	8511	43%	10%	11%	8%	12%	16%
19990809	1614488	103.9	1964682	126.4	62305	4.0	204310	13.1	15543	8071	48%	11%	10%	7%	10%	14%
19990810	1606181	104.3	1941150	126.0	51723	3.4	161771	10.5	15405	7200	53%	11%	11%	6%	9%	9%
19990811	1607172	104.3	1951183	126.6	60291	3.9	187802	12.2	15410	7383	52%	11%	10%	7%	9%	11%
19990812	1614185	104.6	1978232	128.2	75051	4.9	222660	14.4	15432	8916	42%	11%	11%	8%	13%	15%
19990813	1590489	104.9	1969963	129.9	102074	6.7	335814	22.1	15163	9055	40%	10%	10%	8%	11%	21%
19990814	1458422	108.8	1773491	132.3	68549	5.1	300503	22.4	13409	7606	43%	10%	10%	7%	11%	19%
19990815	1551331	104.7	1867828	126.0	37987	2.6	164505	11.1	14824	7252	51%	11%	10%	8%	10%	10%

[10] All flights that are less than the scheduled flight times or incur fewer minutes than the schedule are counted as zero minutes of delay (i.e., a flight that arrives eight minutes earlier than the scheduled flight time is counted as 0 in the computations). The same logic applies when measuring arrival delay.

Table 4 is identical to Table 3 in the first six columns except gate-to-gate time (block time) values are shown instead of arrival delay values. Reading right to left for the same 8/1/99 day (annotated as 990801 in the table), 67 percent of the flights made their block time, ranging from 56 percent on 8/12 to 69 percent on 8/15. Breakdowns of these gate-to-gate delays on 8/1/99 are: 1-5 minutes, 6-10 minutes, 10-15 minutes, and over 15 minutes, which were 15, 18, 4, and 6 percent respectively. In addition, average taxi-times (based on recorded observations between 13,000+ and 15,000+ flights) are presented. The variation between the taxi-out times ranged between 15 minutes on August 15th and 18.5 minutes on August 13th. Typically, the taxi-in time has a relatively small variability (i.e., the times from the 15 days in the table ranged from a low of 6.1 minutes to a high of 6.6 minutes).

Note: If an analyst desires to conduct performance comparisons by city pair over multiple years, then it is necessary that the number of flights and stage length (i.e., airborne minutes) be considered to get accurate values for basis of comparisons. In addition, year-by-year comparisons may be misleading because of different sets of reported city pairs in the ASQP.

Table 4. NAS Performance by Day (Gate-to-Gate Delay Details) - Source: ASQP

Date	Airb Min	Avg Airb Min	G2G Min	Avg G2G Min	G2G Delay Min	Avg G2G Del	# of Flts.	G2G Del. (# >0 Min)	G2G Del. (<1 min)	G2G Del, (1-5)	G2G Del. (6-10)	G2GDel (11-15)	G2G Del >15	T-Out Min	T-In Min
990801	1529516	104.8	1855115	127.1	48064	3.3	14600	4873	67%	15%	8%	4%	6%	15.7	6.6
990802	1589900	103.2	1919513	124.6	41736	2.7	15405	5008	67%	16%	8%	4%	4%	15.2	6.3
990803	1594775	103.5	1936492	125.6	51637	3.4	15414	5551	64%	16%	9%	5%	6%	16.0	6.2
990804	1606159	104.5	1954680	127.1	65928	4.3	15378	6286	59%	18%	10%	5%	8%	16.4	6.3
990805	1615867	105.2	1970618	128.3	77336	5.0	15366	6401	58%	17%	10%	5%	9%	16.8	6.3
990806	1615488	103.9	1956277	125.9	49172	3.2	15544	5878	62%	18%	10%	5%	5%	15.7	6.3
990807	1482315	107.9	1779130	129.5	41636	3.0	13738	4523	67%	16%	8%	4%	5%	15.4	6.3
990808	1578191	106.3	1903981	128.2	65521	4.4	14853	5663	62%	16%	10%	5%	7%	15.9	6.3
990809	1613392	103.8	1963442	126.4	62292	4.0	15537	5727	63%	16%	9%	5%	7%	16.4	6.2
990810	1605016	104.2	1939806	126.0	51700	3.4	15398	5896	62%	18%	10%	5%	5%	15.7	6.1
990811	1606061	104.3	1949913	126.6	60273	3.9	15404	5941	61%	17%	10%	5%	7%	16.2	6.1
990812	1613019	104.6	1976907	128.2	75032	4.9	15425	6824	56%	18%	10%	6%	10%	17.3	6.3
990813	1589296	104.9	1968307	129.9	101942	6.7	15156	6447	57%	17%	9%	6%	11%	18.5	6.5
990814	1456585	108.7	1771280	132.2	68319	5.1	13400	4761	64%	15%	8%	5%	8%	17.1	6.4
990815	1550067	104.6	1866362	126.0	37959	2.6	14816	4574	69%	15%	8%	4%	4%	15.0	6.3

Table 5 below is very similar to the above table that portrays the NAS. It presents an extract of the daily performance for one airport, Boston-Logan International Airport (BOS). As one can establish from the table, there was a wide range of the performance into BOS, ranging from 5.1 minutes behind schedule with 76 percent of the 308 arriving flights meeting their scheduled block times on August 3rd to an average of 35.4 minutes behind schedule with only 44 percent of the 281 arriving flights on August 15th meeting their scheduled block times.

Table 5. Airport Performance - Flights to BOS (August 1999) - Source: ASQP

		Summary of Gate-to-Gate and Arrival Delays										Percentage of Gate-to-Gate Delays				
Apt	Date	Airb Min	Avg Air min	G2g Min	Avg G2G Min	G2G Del	Avg G2G Del	Arr. Delays (min)	Avg Arr. Del	Arrivals	#Gg2G Flts. Del.	G2g Del <=0	G2g Del (1-5)	g2g Del (5-10)	g2g Del (10-15)	G2g Del. (≧15)
BOS	990801	35669	126.9	43983	156.5	1623	5.8	6089	21.7	281	120	57%	12%	11%	6%	13%
BOS	990802	35458	116.3	43725	143.4	440	1.4	1584	5.2	305	67	78%	13%	6%	1%	2%
BOS	990803	35774	116.2	44200	143.5	675	2.2	1570	5.1	308	74	76%	8%	8%	5%	3%
BOS	990804	36033	119.7	44265	147.1	958	3.2	2430	8.1	301	102	66%	15%	9%	4%	5%
BOS	990805	37169	127.3	47143	161.5	3885	13.3	7042	24.1	292	143	51%	11%	7%	3%	28%
BOS	990806	37170	119.9	45419	146.5	722	2.3	2519	8.1	310	91	71%	14%	6%	4%	5%
BOS	990807	33189	126.2	39703	151.0	336	1.3	1420	5.4	263	50	81%	11%	5%	2%	2%
BOS	990808	38098	131.4	45460	156.8	2036	7.0	4667	16.1	290	150	48%	13%	12%	10%	16%
BOS	990809	37262	119.1	45837	146.4	944	3.0	3476	11.1	313	86	73%	14%	5%	4%	5%
BOS	990810	36920	119.5	44775	144.9	711	2.3	2244	7.3	309	94	70%	17%	7%	2%	4%
BOS	990811	37647	122.2	46738	151.8	2245	7.3	4683	15.2	308	147	52%	16%	10%	9%	12%
BOS	990812	37961	121.7	46914	150.4	1431	4.6	3872	12.4	312	149	52%	20%	12%	7%	9%
BOS	990813	37368	122.1	46646	152.4	2347	7.7	5682	18.6	306	135	56%	17%	6%	7%	14%
BOS	990814	31976	134.4	38504	161.8	1254	5.3	5519	23.2	238	73	69%	8%	7%	5%	10%
BOS	990815	37126	132.1	45752	162.8	2941	10.5	9948	35.4	281	157	44%	15%	12%	9%	19%

2) Summaries of actual taxi-in and taxi-out times on a per flight basis have been added to PMAC. Table 6 below presents an extract of taxi-out times and portrays a sample of taxi time trends at some of the busiest airports from 1995 through 1999.

The values portrayed in Table 6 (presented in descending order) are derived from the ASQP at 15 airports that incurred the longest taxi-out times in 1999. This view is based on all reportable flights to DOT. Additionally, the hourly distributions of actual hourly taxi-in and taxi-out times are included in one of the views (in Module 3) through PMAC.

Moreover, it is noteworthy that the taxi-out times at the New York airports rank in the top three in the NAS. The times in the summer months tend to be higher than the other months, primarily due to higher summer travel and the propensity for more inclement weather, i.e., thunderstorms, low ceiling, and visibility, especially at the major Eastern airports (see the shaded regions).

Table 6. Top 15 Airport Taxi-Out Times (1999) - Source: ASQP

Taxi-Out Times – Monthly Averages 1999													
Month Apt	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg
EWR	27.1	25.1	26.3	29.3	32.2	31.8	37.6	31.9	28.7	28.3	25.9	24.8	29.1
JFK	28.5	24.8	26.4	26.3	30.1	30.5	35.0	33.3	29.1	26.5	25.9	25.5	28.5
LGA	24.5	24.9	23.5	27.2	29.3	31.3	31.5	28.3	27.0	29.1	23.6	22.7	26.9
DTW	23.5	20.4	20.4	22.2	19.9	21.4	21.4	19.8	19.0	19.1	18.2	20.1	20.4
PHL	20.1	17.5	17.6	19.3	21.9	23.0	24.5	23.6	20.6	18.1	17.7	17.6	20.1
ATL	18.3	19.2	18.5	19.1	20.5	22.2	22.6	21.3	19.2	19.8	19.7	19.3	20.0
BOS	20.7	18.3	19.2	17.1	18.3	20.5	23.1	19.6	20.4	20.9	19.4	18.8	19.7
ORD	19.3	17.3	17.4	20.7	21.7	23.5	23.6	19.3	18.7	17.9	17.7	17.7	19.6
MIA	18.9	18.7	18.7	19.2	19.4	21.3	20.8	21.1	19.4	18.6	18.7	19.1	19.5
MSP	22.3	17.5	16.8	17.8	19.6	21.3	21.9	20.1	18.1	17.7	17.6	19.9	19.2
IAD	17.8	15.9	17.9	18.8	19.3	20.4	22.2	20.7	20.0	19.0	18.4	17.5	19.0
HNL	18.4	18.9	18.6	18.7	18.9	19.1	18.8	18.7	18.6	19.2	18.9	19.4	18.8
DFW	18.0	16.2	17.8	18.1	22.6	21.8	18.0	18.3	18.5	17.6	17.9	18.5	18.6
STL	19.8	17.3	16.6	18.3	19.3	20.6	19.6	18.8	17.5	17.4	16.8	17.3	18.3
CVG	20.6	17.3	17.3	17.5	16.6	17.1	17.6	17.5	16.4	17.2	16.8	17.9	17.5

Table 7 also shows the trends in the taxi-in and taxi-out time of several airports over multiple years. Once again, the values are generated from the data provided by the airlines via the ASQP that ASD-400 has been processing since 1995. Each annual file has approximately five million records or 13,000-16,000 reported flights per day. Note that the times have increased during the last five-year period. In this illustration, from 1995 to 1999, the taxi times have increased at all but one airport, Boise, ID. Of the 80 airports tracked in PMAC, 75 showed higher average taxi-out times in this five-year time span.[11]

Table 7. Summary Report of Taxi-Time Trends (1995-1999) - Source: ASQP

Apt	Taxi-Out 95	Taxi-Out 96	Taxi-Out 97	Taxi-Out 98	Taxi-Out 99	TO Change (95-98)	TO Change (95-99)	Taxi-in 95	Taxi-In 96	Taxi-In 97	Taxi-In 98	Taxi-In 99	Taxi-In Change (95-98)	Taxi-In Change (95-99)
ABQ	9.9	10.9	10.1	9.8	10.2	-0.2%	3.1%	4.4	4.3	4.4	4.2	4.5	-3.7%	2.3%
ATL	18.1	17.2	17.4	18.7	20.1	3.3%	10.9%	6.9	7.1	7.5	8.2	8.5	17.5%	22.2%
AUS	9.2	9.6	9.6	10.2	10.6	10.7%	15.1%	3.3	3.4	3.5	3.7	4.5	10.3%	34.4%
BDL	10.9	11.8	11.5	12.1	13.5	11.5%	24.1%	4.3	4.4	4.4	4.4	4.8	3.2%	11.4%
BHM	8.7	9.1	9.4	9.4	10.1	7.7%	15.8%	3.0	3.2	3.3	3.4	3.5	11.7%	17.2%
BNA	10.3	10.7	11.0	10.7	10.9	3.4%	5.2%	5.1	5.2	5.1	4.9	5.0	-3.6%	-2.9%
BOI	9.6	9.1	9.2	8.8	8.6	-7.8%	-9.7%	3.7	3.5	3.4	2.9	3.0	-20.8%	-17.6%
BOS	15.4	16.4	16.8	18.1	19.8	17.2%	28.4%	6.8	6.7	6.8	7.5	7.9	10.8%	17.0%
BUF	8.9	9.6	10.1	10.4	11.2	16.6%	25.7%	3.2	3.2	3.3	3.5	3.7	8.7%	17.9%
BUR	9.4	9.3	9.2	9.3	9.4	-0.9%	0.3%	2.0	2.0	2.2	2.2	2.1	10.3%	8.9%
BWI	11.7	12.2	11.4	11.3	12.1	-3.2%	3.8%	4.5	4.6	4.7	4.3	4.4	-3.1%	-1.8%
CLE	12.9	13.7	14.6	14.9	16.3	14.8%	26.2%	4.8	4.6	4.6	4.5	4.7	-7.1%	-3.2%
CLT	13.6	13.9	13.9	14.2	14.5	4.5%	6.3%	5.2	5.6	5.3	5.1	5.3	-2.5%	0.7%

[11] Comparisons of 1995 to 2001 (pre 9/11) showed 75 out of 80 airports had higher average taxi-out times.

3) The data processing for January 1998 to present includes summary reports. A sample view of flights for February 1999 to Dallas/Ft. Worth (DFW) is provided in Table 8.

This type of sample table can assist the analyst in understanding the historical performance of the NAS, specifically by city pair. The CODAS and ASPM summary tables **(CDSUYYMM.DBF and AMSUYYMM.DBF)**, which contain flights to/from 200+ airports, are available for analysis through the present timeframe.

Table 8. Flight Performance Summary Report by City Pair (February 1999) - Source: CODAS

Dep	Arr. Airport	# of Flts	Sched. Gate-to-Gate				Actual Gate-to-Gate			Filed ETE				Planned ETE			Airborne			
			Min	Max	Avg	Std	Min	Max	Avg	Min	Max	Avg	Std	Min	Max	Avg	Min	Max	Avg	Std
ABQ	DFW	205	96	111	102	4.3	79	128	97.2	68	95	75.7	3.9	77	95	82.8	64	88	74.9	4.1
ATL	DFW	742	124	156	142.1	7.7	115	224	138.5	100	148	115.8	7.3	99	149	114.9	95	164	113.9	8.7
BOS	DFW	333	251	278	267.2	8.9	206	333	248.5	195	258	222.4	13	192	259	222.9	187	251	221.1	12
BWI	DFW	140	201	220	212.3	5.5	160	228	197.9	149	201	176.4	10	157	201	176.6	145	198	175.1	11
CLT	DFW	245	171	182	175.3	3	144	212	170.7	128	171	146.8	8.6	132	168	147.3	129	186	147.8	8.9
CVG	DFW	214	140	160	150.9	7.2	115	207	145.5	107	164	122.5	7.1	111	168	125.3	97	183	121.7	10
DCA	DFW	379	198	219	206.8	6.3	161	241	196.8	141	201	173.9	9.8	150	199	174.6	144	220	173.6	11
DTW	DFW	305	178	196	184.5	4.3	143	274	175.7	127	175	148.3	9.9	132	175	150.1	121	188	147.1	11
EWR	DFW	379	227	254	238.1	5.2	181	306	226.6	168	228	195.6	12	169	228	196.5	165	259	194.8	12
HNL	DFW	79	409	420	417.1	2.9	388	475	420.5	387	414	393.7	2.8	387	978	401	369	439	394.5	15
IAD	DFW	171	197	210	202.6	4.5	162	236	194.2	149	193	170.6	9	152	193	171	144	207	171	11
JFK	DFW	53	240	256	247.9	8.1	200	296	235.4	181	228	204.2	14	184	228	206.3	174	254	198.1	14
LAS	DFW	272	137	160	151.6	7.2	128	217	150.2	113	152	128.8	6.9	119	151	133.5	110	196	127.4	8.8
LAX	DFW	486	162	188	176.9	7.8	146	234	174.7	133	170	149.1	7.2	138	173	153.4	130	185	148.1	8.2
MEM	DFW	271	83	103	95.4	3.9	74	133	92.67	62	106	71.6	4.7	65	109	71.6	58	111	71.8	6.1
ORD	DFW	785	137	157	146.3	5.1	109	228	141.1	95	145	117.2	7.3	102	153	121.9	95	193	116.8	9.4
PIT	DFW	186	191	200	193.7	3.2	155	243	182.3	139	193	159.9	10	145	196	162.9	137	224	159.2	11
SFO	DFW	345	189	215	204	7.3	174	267	198	154	194	170.7	8.4	162	197	176.9	152	241	169	9.2

After the origin/destination designators in the first two columns, the # of Flts column represents the number of flights collected in the respective month. For example, in the first row, there are 205 reported flights from Albuquerque (ABQ) to DFW for the month. Flight times are presented for key city pairs in five ways: 1) Scheduled Gate-to-Gate, 2) Actual Gate-to-Gate, 3) Filed Estimated Time En route (ETE), 4) Planned ETE, and 5) Airborne. One interesting observation for the ABQ to DFW flight is that the average actual gate-to-gate time was almost 5 minutes less than the scheduled gate-to-gate time (97 minutes versus 102 minutes). Note the scheduled flight time for this city pair ranged from a low of 96 minutes to a high of 111 minutes, or a 15-minute differential. Interestingly, for a subset of flights to DFW portrayed in the sample table, the monthly averages of 17 out of 18 actual gate-to-gate times are less than the scheduled gate-to-gate times. A computed standard deviation of scheduled flights was 4.3 minutes, which is identical to a Detroit (DTW) to DFW flight that is significantly longer (185 minutes). Therefore, there is more variability in the shorter ABQ to DFW flight.

The Filed ETE column represents the carriers filed ETE (in minutes) from the ETMS flight plan (FZ) message. Flights into DFW for the month averaged about 75.7 minutes. In contrast, the planned ETE, which represents the FAA's planned flight time (in minutes), should be relatively close to the filed ETE. However, in this case, the average planned flight time was 82.8 minutes, or about a 7-minute difference from the filed ETE.

The Airborne column corresponds to either 1) the wheels off to wheels on time stamp from the ASQP per either ACARS or manual observations for non-ACARs equipped aircraft, or 2) the difference in the AZ and DZ messages designated in CODAS with adjustments for the AZ and DZ gap. For ABQ to DFW flights, the average time is 74.9 minutes. Again, it is interesting to note that the average airborne time is less than the filed ETE in 14 out of 18 flights in the table.

Other columns not annotated in Table 8, which are in the **CDSUYYMM.DBF and AMSUYYMM.DBF** files, include the airborne delay, gap_az, and gap_dz time. The airborne delay is the computed difference between the airborne time and the filed ETE. The gap_az is the time between the AZ message time stamp from the ETMS and the wheels on time stamp from the ASQP. The gap_dz is the same as the gap_az, except that it is the time between the AZ message and the wheels off. In cases where there is not an ASQP flight, the gaps are estimated by using a calculated median ASQP gap by airport and time.

4) Table 9 below presents an easy way of accessing both the block hour and airborne costs from the airlines submission of the Form 41 data to DOT[12]. The definition of the direct operating costs (ADOC) illustrated in this table is the aggregated cost of the crew, fuel and oil, and maintenance costs. The airborne cost category is based on the costs accrued during the airborne phase of the flight. These costs are always higher than the block hour cost (a combination of ground and airborne costs) because airborne costs are always larger than ground costs.

Each record has an aircraft type in any combination of carrier and airborne or carrier and block time. Additionally, the aircraft categorized as freight also have airborne and block time costs. For example, the average airborne cost of a B737-400 is $1,937 per hour; crew costs are $999 per hour; fuel and oil is $629 per hour; and maintenance cost is $309 per hour. In addition, indirect operating costs are presented in the rentals and depreciation columns. The reported load factor is 68 percent.

[12] At the time of this document publication, the dollars are in 1996 dollars. OMB inflation factors need to be applied to adjust for the proper year.

In addition to the hourly airborne cost, an hourly block cost of $1,637 is available. Similarly, airfreight costs are presented for the relevant aircraft type.

Table 9. Summary of ADOC Costs ($1996) - Source: DOT

AC Type	Source Type	Hour Type	Load Factor	Seats	Crew $/HR	Fuel $/HR	Maint $/HR	ADOC	Rentals $/HR	Deprec $/HR
B-737-4	Carrier	Airborne	0.680	144	999	629	309	1,937	694	88
B-737-4	Carrier	Block	0.680	144	845	531	261	1,637	586	74
B-737-5	Carrier	Airborne	0.686	110	663	566	464	1,693	384	139
B-737-5	Carrier	Block	0.686	110	552	471	386	1,409	319	115
B-747-1	Air freight	Block	0.000	0	887	2,382	2,214	5,483	423	369
B-747-1	Air freight	Airborne	0.000	0	972	2,609	2,424	6,005	463	404
B-747-1	Carrier	Airborne	0.747	410	2,360	2,750	2,001	7,111	425	605
B-747-1	Carrier	Block	0.747	410	2,213	2,580	1,877	6,670	399	568
B-747-2/3	Air freight	Block	0.000	0	1,833	1,468	2,815	6,116	1,535	461
B-747-2/3	Air freight	Airborne	0.000	0	1,995	1,599	3,064	6,658	1,671	502
B-747-2/3	Carrier	Airborne	0.773	369	2,372	2,880	2,104	7,356	1,089	747
B-747-2/3	Carrier	Block	0.773	369	2,224	2,700	1,973	6,897	1,021	700
B-747-4	Carrier	Airborne	0.745	400	2,680	2,590	1,207	6,477	1,744	243

5) Additional cancellation and diversion files have been generated for all operations from 1995 and beyond from the ASQP data. The following Tables 10, 11, and 12 illustrate the types of files that can be accessed and retrieved in PMAC.

Table 10 shows the annual cancellations at the arrival airport (i.e., a cancelled flight from Atlanta Hartsfield International Airport (ATL) to DTW is tabulated as a DTW cancellation) in 1998 as reported through the ASQP[13]. Note the very large number of cancellations at DTW and Minneapolis/St. Paul (MSP) in September due to a Northwest Airlines pilots strike. While this information is useful for viewing patterns at the airports, a limitation is that the cause of the cancellation, as is true in the case of a diversion, is not reported. Nevertheless, it can assist an analyst who needs to drill down to events on a monthly, daily, or flight-by-flight basis.

[13] Typically, on a weekday, the ASQP, with 10-12 reporting carriers, contains about 15,000 flights. In contrast, the OAG, which has all scheduled air carrier and air taxi/commuter flights, contains about 40,000-45,000 flights on a typical weekday. The cancellation rate has been reported at approximately two to three percent over the recent years.

Table 10. Cancellations at Top 10 Airports in 1998 - Source: ASQP

	MONTH												
	Jan	Feb	Mar	Apr		Jun	Jul	Aug	Sep	Oct		Dec	Total
DTW	459	258	350	555	548	692	465	1386	5894[14]	174	133	250	11164
ORD	1362	757	1213	462	807	986	757	1012	886	727	585	564	10118
MSP	497	304	304	410	549	685	279	1244	5195	174	186	205	10032
SFO	665	882	415	251	517	431	403	446	614	308	494	534	5960
ATL	588	483	428	387	390	540	432	544	806	268	350	454	5670
DFW	495	423	415	292	339	403	459	565	648	704	209	684	5636
LAX	539	622	431	305	423	428	454	418	644	357	388	410	5419
STL	658	344	484	265	387	486	453	264	410	195	218	329	4493
EWR	518	393	331	227	390	611	370	371	502	204	196	232	4345
BOS	508	283	264	182	250	534	257	390	511	279	242	340	4040

Table 11 below illustrates a view of the number of reported daily cancellations to MSP for the first 15 days of March 1998. Once the analyst identifies the day of interest, then it is very easy to drill down to the specific flights, if necessary, to the **CXLYYMM.DBF** file, which is on the Share1\Local drive on the data storage device, Tweedledee. This view is very useful for adjusting demand and comparing "bad days" in the NAS to baseline days.

Table 11. Cancellations at MSP (March 98) - Source: ASQP

Arrival Airport	Year	Month	Day	Daily Cancels
MSP	98	3	1	5
MSP	98	3	2	8
MSP	98	3	3	6
MSP	98	3	4	4
MSP	98	3	5	2
MSP	98	3	6	6
MSP	98	3	7	1
MSP	98	3	8	20
MSP	98	3	9	55
MSP	98	3	10	7
MSP	98	3	11	8
MSP	98	3	12	7
MSP	98	3	13	12
MSP	98	3	14	4
MSP	98	3	15	6

Another variation of a summary view is an overview of diversions of a given year, in this case, 1998. Table 12 shows all the diversions that occurred from flights scheduled to the respective arrival airports (similar to the cancellation summary file, Table 10) as reported through the ASQP. The percentage of reported flights at each airport varies depending on the proportion of air carriers that serve the airport.

[14] A Northwest Airlines pilot strike caused these numbers to spike up at DTW and MSP in September 1998.

Table 12. 1998 Diversions (Top 10 Airports) - Source: ASQP

	MONTH												
Arrival Airport	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
DFW	59	79	128	71	16	93	17	37	13	198	30	97	838
STL	97	48	108	71	57	85	100	68	24	49	40	26	773
ORD	66	47	56	28	57	120	40	178	32	89	32	25	770
SFO	75	49	46	51	59	84	59	25	31	27	60	187	753
ATL	38	29	37	108	66	51	47	61	43	9	19	19	527
MSP	22	7	54	40	63	148	17	56	18	14	12	16	467
LGA	54	26	24	81	42	86	35	69	17	7	12	7	460
IAH	54	42	30	8	15	48	25	69	19	47	62	25	444
EWR	26	31	14	56	60	60	53	47	29	18	12	14	420
PHX	73	43	28	15	9	19	22	20	10	18	24	100	381

6) Table 13 below contains an extract of updated hourly observation weather files. Additional fields such as precipitation codes are included.

Note: The hourly observation files **(WXYYMM.DBF)** available in PMAC contain additional fields not shown in Table 13. The table has selective fields for illustrative purposes.

Table 13. Thunderstorm Events - Source: NCDC Surface Data

Airport	Date	Local Time	GMT	Ceiling (feet)	Visibility (miles)	Present Weather Obs. #1	Present Weather Obs. #2
ATL	970617	1515	1915	2100	2	097	999
ATL	970617	1527	1927	2100	5	095	080
ATL	970617	1537	1937	2100	1.75	097	999
ATL	970617	1556	1956	1100	1.75	095	080
ATL	970617	1600	2000	1300	3	095	080
ATL	970617	1613	2013	1600	3	095	081
ATL	970617	1626	2026	1800	1	097	999
ATL	970617	1633	2033	1500	1.75	097	999
ATL	970617	1646	2046	1500	1.5	095	081
ATL	970617	1700	2100	1500	6	095	080
ATL	980403	1538	2038	400	5	095	080
ATL	980403	1553	2053	400	6	017	999
ATL	980403	1838	2338	200	1.5	095	080

Table 13 provides several observations that showed some evidence of thunderstorms at the *airport*, per the codes at ATL for two days: 6/17/97, and on 4/3/98. Codes 095 and 097 indicate thunderstorm events with precipitation; code 017 indicates a thunderstorm event without precipitation; codes 080 and 081 indicate different levels of rain showers; and code 999 indicates a manual observation with no reporting event. This table can be used to identify the types of precipitation and changing weather conditions. Additionally, it acts as a basis for changing model input for an airport's different instrument and visual runway configurations.

7) Table 14 below presents updated airport capacities based on the most used runway configurations during IFR, MVFR, and VFR conditions. These values contain minimum/maximum and 50/50 arrival and departure capacities. The airport capacities are based on a 2000 Airport Capacity Survey that was sent to 103 towers in March 2000. Virtually all of the sites, which included all of the major airports, responded to the survey.

Listed below is an extract of a recent survey response from Charlotte-Douglas International Airport (CLT). The values in the responses are a function of several parameters: the number of runways, wind speed and direction, ceiling and visibility, fleet mix, arrival sequencing, threshold spacing on the runway, and several other parameters. The following information is broken down according to the most used Visual Approach, Marginal Approach, and Instrument Approach configurations.

The shaded cells in Table 14 below bound the departure and arrival capacities. They are defined as:

- Ref. A - Max Arrival Capacity – Arrivals: the maximum number of arrivals in aircraft per hour that the airport can accommodate when arrivals have the priority
- Ref. B - Max Arrival Capacity – Departures: the maximum number of departures in aircraft per hour that the airport can accommodate when departures have the priority
- Ref. C&D - 50/50 Arrival Capacities for both Arrivals and Departures: the airport capacity when the airport is running a 50/50 mix for both departures and arrivals
- Ref. E - Max Departure Capacity – Arrivals: the maximum number of arrivals during a arrival push
- Ref. F - Max Departure Capacity – Departures: the maximum number of departures during a departure push

Table 14. Illustration of 2000 Airport Capacities at CLT

Ref	Attribute	Configuration for CLT		
		Visual Approach	Marginal VFR Approach	Instrument Approach
	Arrival Runways	18L/R	18L/R	18L/R
	Departure Runways	18L/R, 27	18L/R, 27	18L/R, 27
	Min Ceiling (feet)	5000	3500	200
	Min Visibility (nmi)	10	8	.5
	Max Ceiling (feet)	Unl.	5000	
	Max Visibility	Unl.	8	
A	Max Arr. Cap. *Arrivals*	80	76	72
B	Max Arr. Cap *Departures*	45	40	40
C	50/50 *Arrival* Cap	60	60	60
D	50/50 *Departure* Cap	65	65	60
E	Max Dep Cap. *Arrivals*	40	40	30
F	Max Dep Cap. *Departures*	80	80	80

8) The range in flight times for all scheduled origin-destination pairs is presented below in Table 15. The number of flights: minimum, maximum, and average scheduled flight time, as well as the 15th, 25th, and 50th percentiles are presented. These tables are generated for October flights from 1995 to 2000.

An interesting insight can be observed by evaluating a sample of nine destinations with flights departing from ATL. There is a total time difference of 37 minutes from the 15th to 50th percentile to these destinations. Conversely, if departures are examined from the same nine airports for flights flying into ATL, then from the 15th to 50th percentile, there is a total time difference of 55 minutes. The analyst can garner many insights from this type of observation such as 1) the schedules for flights into ATL are stretched out slightly to accommodate the less predictable arrivals, and 2) there is an additional 62 minutes of average flight time of flights going into ATL than flights departing ATL from the same city pair combinations.

Table 15. Scheduled Flight Times by City Pairs (October 2000) - (in minutes)

Depart	Arrive	# Flights	Min	Max	Avg	15th	25th	50th	Diff. 15th to 50th
ATL	ALB	93	124	135	129	124	124	128	4
ATL	AUS	217	134	153	141	135	135	138	3
ATL	BHM	278	47	57	51	47	48	52	5
ATL	BNA	377	55	70	63	59	59	61	2
ATL	BOS	705	138	166	150	143	145	148	5
ATL	BTR	93	90	93	92	90	90	92	2
ATL	BUF	155	113	132	121	113	118	119	6
ATL	BWI	393	95	115	104	97	100	102	5
ATL	CHA	277	37	48	43	40	40	45	5
ALB	ATL	93	145	152	149	145	145	151	6
AUS	ATL	217	119	139	128	122	122	126	4
BHM	ATL	278	52	67	60	54	55	64	10
BNA	ATL	377	59	77	69	62	68	70	8
BOS	ATL	675	154	175	167	161	165	170	9
BTR	ATL	94	88	99	93	88	88	93	5
BUF	ATL	155	123	135	128	123	124	129	6
BWI	ATL	358	110	123	115	110	111	114	4
CHA	ATL	277	35	50	47	45	45	48	3

9) Data sets with the number of seats by airplane type, developed from OAG data, has been added to PMAC.

This file provides the average number of seats for over 600 aircraft types. Weighted average for the number of seats per aircraft type is built for each aircraft from four months: June, July, October, and November. For example, there were 2,252 scheduled flights reported for an A310 in these months. There were five distinct flights (by carrier) that had different reported seats, 182, 192, 210, 241, and 246. The weighted average is 197 seats for an A310. This information, when applied to a load factor (e.g., commercial carriers were approximately 70 percent in 2002) gives a very accurate assessment for computing the passenger value of time; a key component required when quantifying user benefits.

Table 16. Number of Seats by Aircraft Type (June 2001)

EQUIP	Avg Seats	Flights	1	2	3	4	5	6	7	8	9
A306	248	3735	211	247	250	252	263	0	0	0	0
A30B	257	1072	171	250	258	263	273	280	281	0	0
A310	197	2252	182	192	210	241	246	0	0	0	0
A318	208	60	208	0	0	0	0	0	0	0	0
A319	208	14680	208	0	0	0	0	0	0	0	0
A320	179	36767	139	153	165	167	179	0	0	0	0
A321	179	1817	179	0	0	0	0	0	0	0	0
A330	375	2160	375	0	0	0	0	0	0	0	0
A340	350	2029	350	0	0	0	0	0	0	0	0
A748	45	1426	40	44	47	0	0	0	0	0	0
AEST	9	20877	6	9	0	0	0	0	0	0	0
AN12	50	2638	45	50	0	0	0	0	0	0	0
AN6	50	0	50	0	0	0	0	0	0	0	0
AS50	6	12786	6	0	0	0	0	0	0	0	0
AT43	46	17523	42	46	48	50	0	0	0	0	0
AT44	46	5626	46	48	0	0	0	0	0	0	0
AT72	68	15653	64	68	0	0	0	0	0	0	0
ATP	70	609	70	0	0	0	0	0	0	0	0
B12	4	214	4	5	0	0	0	0	0	0	0
B190	19	63248	9	15	19	21	0	0	0	0	0
B701	160	36	160	0	0	0	0	0	0	0	0
B712	106	3108	106	0	0	0	0	0	0	0	0
B721	130	3081	116	120	125	128	186	0	0	0	0
B722	152	43512	129	146	148	150	157	158	161	164	168

10) Fuel burn performance data for 71 aircrafts types has been added to PMAC. Figure 2 shows the modification made to the Module 3 menu screen to provide this option. Table 17 shows an example of this data for an A306 aircraft.

Fuel usage data is provided for cruise, climb, and descent flight modes for the various flight levels (FL) for the given aircraft type, along with the corresponding rate of climb and descent (ROCD). Figure 2 shows the sub-menu "BADA Fuel Factors" under the "Other Information" menu. Also, a sub-menu for "Seats per A/C type" that is presented in the previous section has been added to Module 3. Table 17 illustrates the fuel burn rates (high, nominal, and low) and the climb rates at different altitudes. For example, at FL 350, the fuel burn rate is 183.8 lbs/minutes; at FL370, the fuel burn rate is 180.8 lbs/minute or a difference of 1.4 percent.

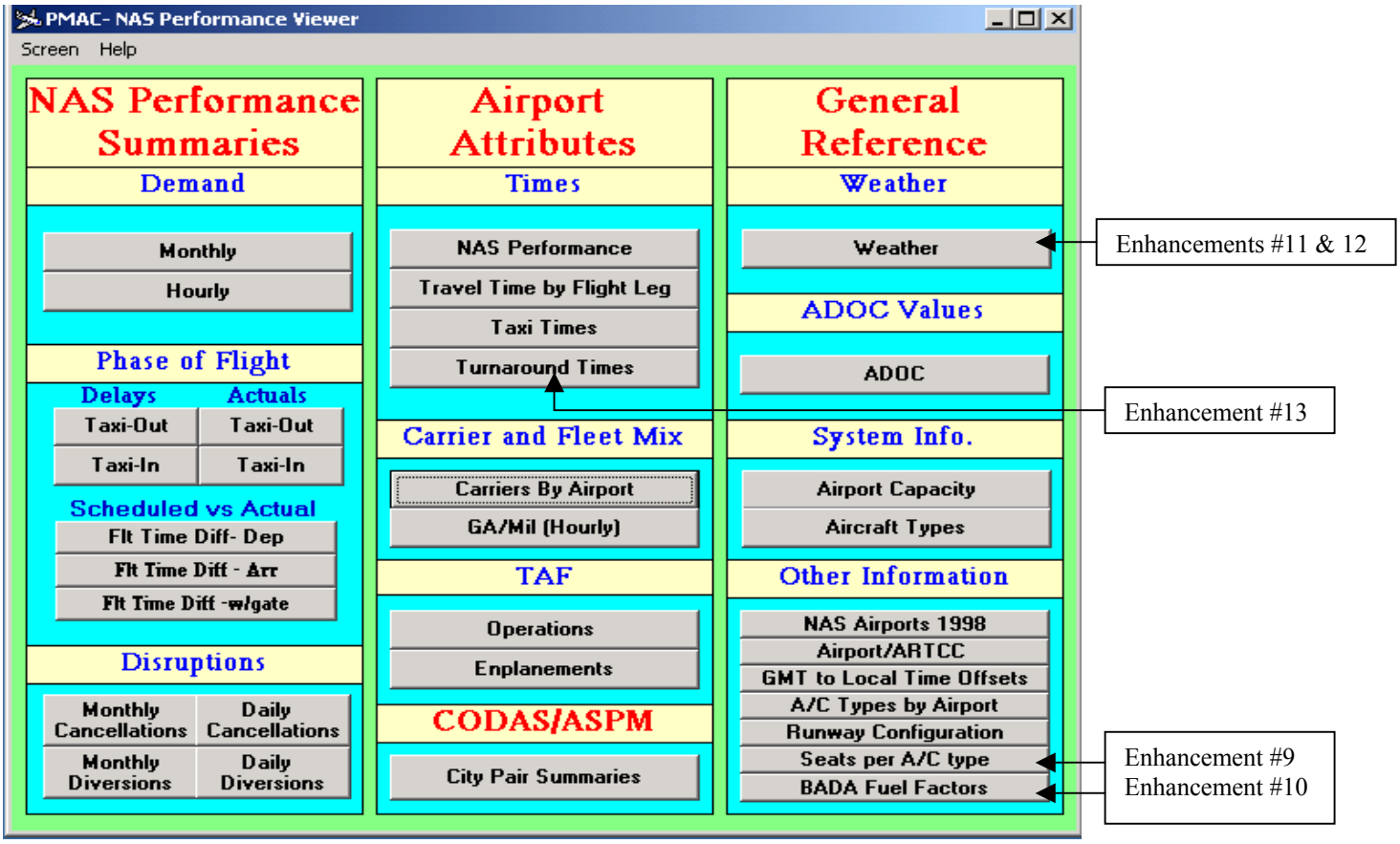

Figure 2. Module 3 Menu Screen – V3.1

Table 17. Fuel Burn Data for A306 - Source: BADA

AC Type	Flt Level (100's)	Cruise TAS [kts]	Cruise fuel lo	Cruise fuel nom	Cruise fuel hi	Climb TAS [kts]	Climb ROCD lo	Climb ROCD nom	Climb ROCD hi	Climb fuel nom	Descent TAS [kts]	Descent ROCD nom	Descent fuel nom
A306	0					157	2210	1990	1620	595.9	131	760	214.3
A306	5					158	2190	1970	1600	589.3	132	780	211.9
A306	10					159	2170	1950	1570	582.7	138	800	209.4
A306	15					166	2290	2030	1650	576.5	149	850	207.2
A306	20					167	2270	2010	1620	569.9	181	1020	68.3
A306	30	230	134.9	179.5	229.9	190	2750	2360	1920	557.8	230	1360	55.1
A306	40	233	134.9	179.5	230.2	225	3350	2780	2270	546.1	233	1380	54.0
A306	60	272	145.3	180.1	219.6	272	4210	3070	2370	522.1	240	1410	51.4
A306	80	280	145.1	180.1	219.8	280	4040	2930	2230	497.6	280	1550	48.7
A306	100	289	145.1	180.1	220.0	289	3860	2780	2090	473.6	289	1590	46.1
A306	120	297	144.8	180.1	220.0	356	3820	2800	2170	451.5	332	1880	43.7
A306	140	306	144.6	180.1	220.2	366	3590	2610	2000	428.4	342	1920	41.0
A306	160	389	181.7	205.3	232.1	377	3360	2410	1820	405.9	353	1960	38.4
A306	180	401	181.0	204.8	231.7	388	3120	2220	1650	384.0	363	2000	35.7
A306	200	413	180.1	204.1	231.3	400	2880	2020	1470	362.7	375	2040	33.3
A306	220	425	179.2	203.5	230.8	412	2630	1810	1290	341.7	386	2080	30.6
A306	240	438	178.4	202.6	230.4	425	2380	1610	1100	321.4	398	2120	28.0
A306	260	452	177.3	201.9	229.9	438	2130	1400	920	301.8	411	2160	25.6
A306	280	466	176.1	201.1	229.5	452	1880	1200	730	282.4	424	2200	22.9
A306	290	468	172.8	198.6	228.0	459	1760	1090	640	273.2	431	2220	21.6
A306	310	464	163.8	191.8	223.8	464	2200	1290	660	254.4	444	2250	19.0
A306	330	459	155.6	186.7	221.8	459	1950	1050	420	236.3	459	2290	16.3
A306	350	455	149.0	183.0	215.8	455	1700	810	170	218.7	455	3150	13.9
A306	370	453	143.5	180.8	199.1	453	1320	510	0	201.9	453	2850	11.2
A306	390	453	139.3	180.6	183.0	453	1080	260	0	185.4	453	2850	8.6
A306	410	453	136.5	167.3	167.3	453	830	10	0	169.8	453	2880	6.2

The next two enhancements (11 and 12) required that the "Historical and Current Weather Data" menu screen be modified to allow their selection. The revised screen is shown in Figure 3.

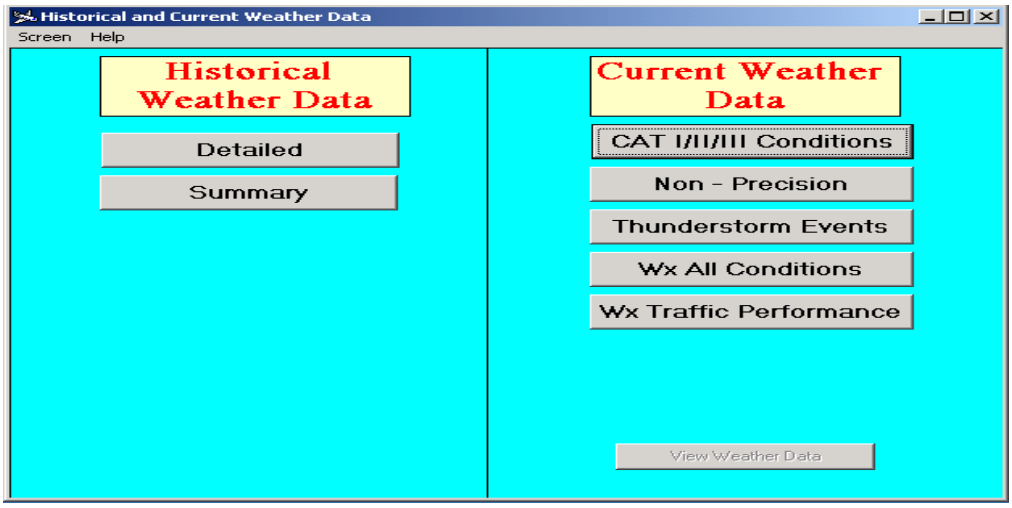

Figure 3. Weather Menu

11) This enhancement maps surface weather observations to specific flights. This relationship can support detailed analysis when assessing the impact of weather on delays in varying conditions.

The two data sources that build the summary tables are the surface weather data from NCDC **(WXYYMM.DBF)** and the ASQP data. These two sources are mapped together by airport, the elapsed weather observation, and the scheduled arrival time. The scheduled arrival time is matched to the duration of the weather observation to identify the weather condition. We have used the common weather condition definitions and bounds for the five conditions, as shown below in Table 18.

Table 18. Weather Condition Definitions

Weather Condition	Ceiling (feet)		Visibility (miles)
1) VFR:	>=3000	AND	>=5
2) MVFR	>=1000 and <3000	OR	>=3 and <5
3) IFR	<1000	OR	<3
4) CAT-I	>=200 and <500	OR	>=0.5 and <1
5) CAT-II/III	<200	OR	<0.5

An example of the **(WXD00APT.DBF)** summary file (as well as a view of three summary files because of their similarities) for a representative airport (ATL) is given below in Tables 19 and 20. The menu screen used to select the different reports is shown in Figure 4.

Table 19. Sample Weather Delay Table by Airport - 2000

Arrival Airport	Weather Condition	Number of Flights	Average Gate-to-Gate Delay (minutes)	Average Arrival Delay (minutes)	Average Departure Delay (minutes)	Percentage of Flights Cancelled	Percentage of Flights Diverted	Percentage of Total Flights
ATL	CAT-2/3	4580	10.8	33.2	24.4	7.6%	0.61%	1.7%
ATL	CAT-I	8924	9.3	27.6	20.3	8.9%	0.54%	3.4%
ATL	IFR	24375	*9.8*	*27.2*	19.4	6.7%	0.44%	9.2%
ATL	MVFR	22116	7.4	17.4	11.8	5.1%	0.19%	8.4%
ATL	VFR	218303	3.2	10.8	9.8	3.4%	0.10%	82.4%

Table 20. Sample Weather Delay Table by Airport - 2000 (Cont'd)

Arrival Airport	Weather Condition	Percentage of Flights Departed Late (> 0 minutes)	Percentage of Flights with Departure Delay (>= 5 minutes)	Percentage of Flights with Departure Delay (>= 10 minutes)	Percentage of Flights with Departure Delay (>= 15 minutes)	Percentage of Flights with Departure Delay (>= 30 minutes)
ATL	CAT-2/3	63.5%	48.1%	38.5%	33.5%	24.0%
ATL	CAT-I	58.9%	44.0%	35.7%	30.6%	20.8%
ATL	IFR	59.0%	43.5%	34.6%	*29.5%*	19.9%
ATL	MVFR	53.8%	36.0%	26.1%	21.0%	12.1%
ATL	VFR	47.9%	29.7%	19.8%	15.3%	9.0%

Flights are presented by departure delays, arrival delays, gate-to-gate delays (time over the scheduled block time), cancelled and diverted flights, and percentages of departure delays. For example, scheduled arrivals into ATL during IFR conditions reported an average of 9.8 minutes of gate-to-gate delay and an average of 27.2 minutes of arrival delay. During IFR conditions, 9.2 percent of all flights into ATL were scheduled to arrive. Similarly, 29.5 percent of flights into ATL that were scheduled to arrive during IFR conditions departed more than 15 minutes late.

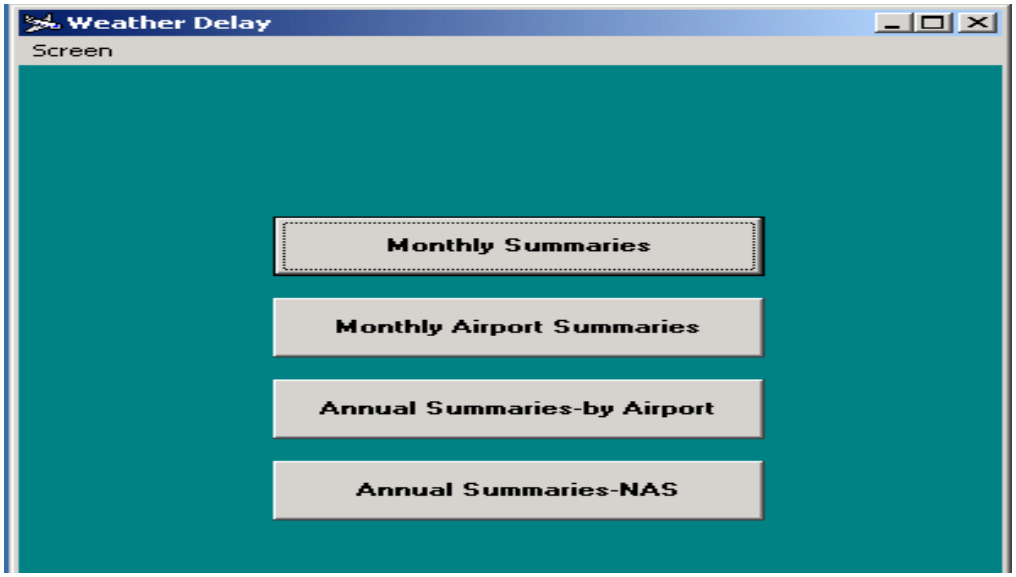

Figure 4. Weather Traffic Performance Menu

12) This enhancement extracts weather occurrences containing thunderstorms and calculates the duration (in minutes) of each thunderstorm at each airport.

Thunderstorms are denoted by codes 17, 29, and 95 through 99 for any of the four Present Weather Manual Observation fields (Pres_WW, Pres_WW1, Pres_WW2, or Pres_WW3). Table 21 provides the description of each thunderstorm code.

Table 21. Thunderstorm Code Descriptions

Thunderstorm Code	Description
17	Thunderstorm, but no precipitation
29	Thunderstorm
95	Thunderstorm, slight or moderate, without hail
96	Thunderstorm, slight or moderate, with hail
97	Thunderstorm, heavy, without hail
98	Thunderstorm combined with dust or sandstorm
99	Thunderstorm, heavy, with hail

The duration of each thunderstorm is calculated by the difference in time from the observation of the thunderstorm to the next weather record. The subsequent weather record may or may not show changing weather conditions and may not be a thunderstorm observation. Weather records without thunderstorms are excluded from the processed thunderstorm files. An example of thunderstorm events that were reported for 5 days at EWR during June 2002 is shown in Table 22.

Table 22. Thunderstorm Events at EWR - Source: NCDC

Airport	Station	Date	Elapsed (min)	Time-local	Time-gmt	Wind direct	Wind speed	Ceil (feet)	Ceil (meter)	VSBY (Miles)	Pres WX	Pres WX1	Pres WX2	Pres WX3
EWR	725020	6/5/2002	19	2332	0332	220	14.0	11811	3600	10.0	17	00	00	-1
EWR	725020	6/5/2002	19	2332	0332	220	14.0	11811	3600	10.0	17	00	00	-1
EWR	725020	6/5/2002	60	2351	0351	210	13.0	10827	3300	8.0	95	80	00	-1
EWR	725020	6/5/2002	60	2351	0351	210	13.0	10827	3300	8.0	95	80	00	-1
EWR	725020	6/6/2002	9	0151	0551	300	13.0	4429	1350	10.0	17	00	00	-1
EWR	725020	6/6/2002	9	0151	0551	300	13.0	4429	1350	10.0	17	00	00	-1
EWR	725020	6/12/2002	7	1600	2000	270	12.1	1476	450	1.3	95	80	10	-1
EWR	725020	6/12/2002	31	1607	2007	250	16.9	1476	450	4.0	95	80	10	-1
EWR	725020	6/26/2002	9	1351	1751	160	12.1	6890	2100	5.0	17	05	00	-1
EWR	725020	6/27/2002	9	1742	2142	260	13.0	5906	1800	9.0	17	00	00	-1
EWR	725020	6/27/2002	14	1751	2151	300	11.1	4921	1500	2.2	95	81	00	-1
EWR	725020	6/27/2002	6	1805	2205	280	13.0	4921	1500	5.0	95	80	00	-1
EWR	725020	6/27/2002	26	1811	2211	300	14.0	4921	1500	1.8	95	80	00	-1
EWR	725020	6/27/2002	14	1837	2237	280	8.0	4921	1500	3.0	95	81	00	-1
EWR	725020	6/27/2002	60	1851	2251	310	6.0	3445	1050	6.0	95	80	00	-1
EWR	725020	6/27/2002	9	1951	2351	010	7.0	6890	2100	9.0	17	00	00	-1
EWR	725020	6/27/2002	53	2051	0051	260	13.0	1969	600	6.0	95	80	10	-1
EWR	725020	6/27/2002	7	2144	0144	220	8.9	3445	1050	4.0	95	81	10	-1
EWR	725020	6/27/2002	60	2151	0151	230	8.9	3445	1050	4.0	95	81	10	-1

The first thunderstorm event (code 17) occurred on June 5, 2002, at 2332 local time and lasted for 19 minutes. The subsequent thunderstorm event (code 95) occurred on June 5, 2002, and lasted for an additional 60 minutes, which gave EWR a total of 79 minutes of thunderstorm activity on June 5, 2002. Similarly, on June 6, there were nine reported minutes of thunderstorm activity at the airport, and on June 12, there were 38 reported minutes, and so forth.

Thunderstorm files are annually compiled files found in the /PMAC/Shared/ directory using the naming convention "wxtstmYY.dbf." These files also list the visibility, ceiling, and wind speed during the thunderstorm event for both local and GMT times. Thunderstorm files are useful in identifying the time, duration of thunderstorm events, and the potential impact of thunderstorm events on flight operations.

13) This enhancement gives turn-around times by carrier and aircraft type from each departure airport represented in the ASQP. This information helps identify any downstream impacts when aircraft move through the NAS on a given day.

Turn-around times are based on tail number, carrier, and departure location and calculated using the time (in minutes) between an aircraft's ASQP arrival and ASQP departure (asqp_dep minus asqp_arr). Turnaround-times greater than 150 minutes were identified as outliers or events that didn't apply to the derivation and were excluded from the data set. The 25th, 50th, and 75th percentiles are calculated for each unique departure airport, carrier, and aircraft type along with a monthly count of the number of reported flights. The turn-time data is available by month. Table 23 below illustrates turnaround times of ten unique carriers and aircraft types departing ATL in October 2000.

Table 23. Turnaround Times (October 2000) – Source: ASPM

Departure	Carrier	ACType	Percentiles			Num. Flights
			25th	50th	75th	
ATL	DAL	B722	56	67	83	610
ATL	DAL	B72Q	55	66	81	1641
ATL	DAL	B733	54	67	87	615
ATL	COA	B733	52	64	81	197
ATL	DAL	B738	68	80	92	410
ATL	DAL	B752	66	76	89	3024
ATL	DAL	B762	65	80	98	389
ATL	DAL	B763	71	82	97	1083
ATL	NWA	DC9Q	52	61	80	181
ATL	DAL	MD80	57	67	79	5911

6.0 NEXT STEPS

At this time, there is an ongoing effort to migrate the data sets and several views in PMAC, along with other current and planned data resident within ASD-400, into an ORACLE 9i environment. PMAC primarily operates through Visual Basic as its front-end GUI (running in Windows NT) with supporting third party software. The databases, FOXPRO 2.6 and Visual FOXPRO, operate on the back-end and sustain all of the data files.

While the data in PMAC has assisted ASD-400 and inter and intra-agencies in numerous efforts over the years, in the short-term and beyond, it will be advantageous to manage the huge amount of information in a true Relational Database Management System (RDBMS), i.e., ORACLE 9i. Furthermore, with the present ongoing evolution of a long-term (10-year) SETA-II contract vehicle, FY01 and FY02 was a practical time to transition ASD-400's data management capability into a more current architecture. Consequently, PMAC V3.1 will continue to have the plethora of data sets, but there will be limited data updates.

Appendix A: List of Data Files in PMAC (In Alphabetical Order)

The following database files (Table A-1) are included in PMAC V3.1, and are easily retrievable through the network storage drive in the Tweedledee sub-directory. Raw data files, specifically, ASQP, ASPM and OAG and the ETMS tables, are also available on the network storage drive. Moreover, raw CODAS files are available in both GMT and local time conversions.

In Table A-1, there are several naming conventions that end in "YY" -- this means that the type of file is an annual representation of the data. Similarly, the "YYMM" implies that the file is monthly for the respective year. The "Category" column gives a general identification scheme for each file. The "Time" column denotes what year(s) (from the beginning year) is accounted for in the associated file. The categories are: 1) weather, 2) performance, 3) demand, 4) delay, 5) disruptions, or 6) other, such as the TAF files or any combination of the category. The "Source" column identifies the primary data and information sources that the file is based on. The categories are: 1) weather, 2) performance, 3) demand, 4) delay, 5) disruptions, or 6) other, such as the TAF files or any combination of the category.

Table A-1. PMAC Database Files

Filename	Category	Description	Time	Source(s)
AC_CLASS	Other	List of aircraft type by maximum takeoff weight. Listed by old and new classes (H, L, S).	As of 1996	Janes, SIMMOD, AFS
AC_SEATS	Other	Weighted average of number of seats for all aircraft with scheduled flights. ***Enhancement #9***	2000 and 2001, based on average of June, July, and August	OAG
ADOC	Other	Direct operating costs (fuel & oil, crew, maintenance) and indirect operating costs (depreciation in rentals, etc.) of air carriers, air freight, and GA/air taxi. Entries consistent with APO-98-8 document, which is based on Form 41 and 298-C submitted airline data. ***Enhancement #4***	1998, inflated with OMB inflation factors	Policy Document APO-98-8
AIRDELYY	Delay	Average airborne delay by month by airport. After 1998, this field can be extracted directly from CODAS and ASQP.	1995 to 1997	ASQP, CODAS
AIRPORT	Other	A listing of 182 airports carried over from ASQP and used for several of the menu options in the GUI.	1996	ASQP
AMSUYYMM	Performance	Key city pair performance summaries: average, min, and max of scheduled flight time, actual block time, ETE, actual airborne, etc. ***Extension of Enhancement #3***	2001 to present	ASPM
APTACYY	Other	A listing of aircraft, daily ops, and ac_type by airport.	2000 (Oct 2000)	ETMS AZ file
APTCARYY	Other	Listing of the arrivals by carrier from the major airports, based on a representative month.	1998 to present (Oct of each year)	OAG
APTYYO	Performance, Delay	Same as for APTYYR, but mapped by O-D pair. The base file that develops the comparative O-D pairs is 1995. ***Enhancement #4***	1995 to present	ASQP
APTYYMMO	Performance, Delay	Same as for APTYYMMR, but mapped by O-D pair. The base file that develops the comparative O-D pairs is 1995. ***Enhancement #4***	1995 to present	ASQP
APTYYR	Performance, Delay	Annual rollup of the performance of all airports from APTYYMM for a given year. Includes flight delay and arrival delay views. Derived from NASYY files. ***Enhancement #4***	1995 to present	ASQP

Table A-1. PMAC Database Files (Cont'd)

Filename	Category	Description	Time	Source(s)
APTYYMMR	Performance, Delay	Monthly views of flight delays and arrival delays. ***Enhancement #4***	1995 to present	ASQP
ASQPOPYY	Other	An estimate of the proportion of ASQP flights to total scheduled flights – 1) percent of sched. from 10 carriers to total ops, and 2) percent of sched. from 10 carriers to total scheduled ops.	1995 and 1996	ASQP
ATMA	Other	Listing of almost 6,000 airports. Includes both towered and non-towered airports by region.	1996	ATS
AWGATEYY	Performance, Delay	Average arrival delay with gate hold by month by airport.	1995 to present	ASQP
BADA	Other	Fuel burn and aircraft performance data for 71 aircraft types. ***Enhancement #10***	2000	Eurocontrol
Cap_db_rev9.mdb	Performance	Current and projected future capacities at major airports. Projected capacities are based on future runway improvements per Airport Capacity Enhancement Plan and estimate of impact of future acquisitions.	2000, 2005 and 2010 Not Active	2000 Cap. Survey, CSSI through ATP and ASD
CDSUYYMM	Performance	Key city pair performance summaries: average, min, and max of scheduled flight time, actual block time, ETE, actual airborne, etc. ***Enhancement #3***	1998 to 2000	CODAS
CDTMYYMM	Performance, Delay	Processed local time file. Identical to raw file except for conversion from Julian second and GMT.	1998 to 2000	CODAS
CENTER	Other	Airport, ARTCC relationship.	1997	Air Traffic
COD_APT	Other	A listing of 182 airports carried over from the ASQP. This file is used for selecting the airport choices in the delay and disruption modules and the CODAS queries.	1996	ASQP
COD99YY or COD20YY	Performance, Delay	All months for the respective year appended from CODYYMM file, sorted by airport.	1995 to present	ASQP
CODYYMM	Performance, Delay	Flight delays, taxi delays, and arrival delays with gate holds by flight number at each airport by month; 19 fields, does not include cancellations and diversions.	1995 to present	ASQP
CODYYMMA	Performance, Delay	Summary table of taxi-in delay (based on the actual time – unimpeded time) by airport by month/hour.	1995 to present	ASQP
CODYYMMB	Performance, Delay	Summary hourly table of all airborne delay by airport by month.	Inactive, 1995 though 1997	ASQP
CODYYMMD	Performance, Delay	Summary hourly table of all taxi-out delay (based on the actual time – unimpeded time) by airport by month.	1995 to present	ASQP
CODYYMMH	Performance, Delay	Summary hourly table of all flight delays (gate-to-gate deviations) by airport by month. Includes the number of flights that exceed their scheduled block times.	1995 to present	ASQP
CODYYMML	Performance, Delay	Summary hourly table of all arrival delays by airport by month. Needs validation. NOT ACTIVE IN PMAC.	1998 to present	ASQP
CODYYMMP	Performance, Delay	Summary table of all peak times by airport by month (based on the largest number of three consecutive hours).	1995 to 1997	ASQP
CXLYYMM	Disruption	Cancellation records of all reported city pairs for the respective year/month/day. NOT IN PMAC MENU.	On shared drive	ASQP

Table A-1. PMAC Database Files (Cont'd)

Filename	Category	Description	Time	Source(s)
CXLYYMM, renamed in 2000 to CXL_YYYYMM	Disruption	Number of reported cancellations at the arrival airport for a given day (e.g., ABE on 9/16/99, had 16 cancelled flights).	Local drive	ASQP
CXLYYTOT	Disruption	Total monthly cancellations by city pair and carriers for respective year/month.	1998 to present	ASQP, Local drive 98-present
CXLYYYY	Disruption	Cancellations at the arrival airport by month with annual total cancellations.	1997 to present	ASQP
DIVYYYY	Disruption	Same as DIVYYMM files but broken down by airport by month with annual total.	1995 to present	ASQP
DIVYYMM Renamed DIV_YYYYMM for 2000 and later	Disruption	Number of diversions that were scheduled to arrive at the arrival airport but were diverted to another airport. Broken down by respective year/month/day.	1995 to present	ASQP
DIVYYTOT	Disruption	Total monthly diversions by city pair for the respective year/month. These were scheduled to arrive at the arrival airport but were diverted to another airport.	1998 to present	ASQP
FAA_TAF	Performance	Hourly adjustment factors to each airport's scheduled demand. Factor based on the ratio of GA+Mil to Total Ops.	1997	TAF
FLEET	Demand	Hourly distribution of GA departure and arrival rates.	1998	4 ETMS days
FLT_TMYY	Performance	Average, minimum, and maximum of scheduled flight times by distinct city pairs. Uses airports from AIRPORT file. Includes the 15th, 25th, and 50th percentiles. ***Enhancement #8***	1995 thru present (Oct. of each year)	OAG
FLTDELYY	Delay	Average difference between scheduled block times and actual block times by airport by month from the *ORIGIN* airport.	1995 to present	ASQP
FLDELYYA	Delay	The average difference between actual gate-to-gate and sched gate-to-gate times by airport by month at the *DESTINATION* airport.	1995 to present	ASQP
HISTDETL	Weather, Performance	Annual average frequency distribution of all ceiling and visibility combinations at major airports. Based on NCDC climatological data.	Observations from 30-45 years	Intern. Meteorological Climate Summary
HISTSUMM	Weather, Performance	Summary tables of frequency of VFR, non-precision, and CAT I/II/III for 180 airports[15].	N/A, 30-45 year historical average	NCDC DATSAV3
MONTH_YY	Demand	Average monthly demand for all flights includes both scheduled and unscheduled flights.	1995 to present	OAG, TAF
NASYYR	Performance, Delay	Appended from NASYYMM, includes same information. Rollup of 12 months. ***Enhancement #4***	1995 to Present	ASQP
NASYYMMR	Performance, Delay	Summary of arrival and gate-to-gate delays in a given year. Also includes taxi time averages. ***Enhancement #4***	1995 to present	ASQP
NASYYO	Performance, Delay	Same as NASYYR but mapped by O-D pair. The base file that develops the comparative O-D pairs is 1995. ***Enhancement #4***	1995 to present	ASQP

Table A-1. PMAC Database Files (Cont'd)

Filename	Category	Description	Time	Source(s)
NASYYMMO	Performance, Delay	Same as NASYYMMR but mapped by O-D pair. The base file that develops the comparative O-D pairs is 1995. ***Enhancement #4***	1995 to present	ASQP
NATYYMMA	Delay, Performance	National average taxi-in time by month/time of day for 100 of the busiest airports.	1995 to present	ASQP, NORMTOTI
NATYYMMD	Delay	National average taxi-out time by month/time of day for 100 of the busiest airports.	1995 to present	ASQP, NORMTOTI (dev. By APO-130)
NORMTOTI	Performance	Unimpeded taxi-times derived by airport, carrier, season, and aircraft type.	1998	ASQP – dev. by APO-130, NORMTOTI (dev. By APO-130)
NORMTO01	Performance	Unimpeded taxi-times derived by airport, carrier, season, and aircraft type.	2001	ASQP
OAGYYMM	Demand	Daily flight information by month. Includes 31-character EDAY field, which allows for query of a specific day beyond 1998.	1995 to present	OAG
OAGYYMMA	Demand	Arrival demand by airport/hour for 300+ towered airports.	1995 to present	OAG
OAGYYMMD	Demand	Departure demand by airport/hr for 300+ towered ASQP airports.	1995 to present	OAG
OAGYYYY	Demand	Monthly summary of departures and arrivals based on daily weekend/weekday counts.	1995 to present	OAG
TAFACEYY	Demand, Performance	The number of air carrier, air taxi/commuter, GA, and military operations. 1990-2015 airport list from WX_APTSAV3 file.	2000	TAF
TAFENPYY	Demand, Performance	The number of air carrier and air taxi/commuter enplanements: 1990-2015 includes growth rates. Airport list from WX_APTSAV3.	2000	TAF
TAF1201	Demand, Performance	The file that contains both ops and enplanements. Received from APO on an annual basis.	2000	TAF
TAXDSTYY	Performance	Annual freq distribution (range 1 to 60 minutes) of actual taxi times for 77 of the busier airports.	1995 to 2001	ASQP
TAXISUMM	Performance, Delay	A comparison of taxi times between 1995 and 2002 at 77 of the busier airports in the NAS. Includes changes in total operations. ***Enhancement #2***	1995 to 2001	ASQP, TAF
TIME_OFF	Other	GMT to local time offset, offsets for late-Oct to April (denoted winter), and April to late-Oct (denoted summer).	NA	
TINACTYY	Performance	Actual monthly average taxi-in time for over 200 airports. ***Enhancement #2***	1995 to present	ASQP
TINDELYY	Delay, Performance	Listing of average monthly taxi-in delay by airport.	1995 to present	ASQP and APO-130
TOACTYY	Performance	Actual monthly taxi-out times for over 200 airports. ***Enhancement #2***	1995 to present	ASQP and APO-130
TODELYY	Delay, Performance	Listing of average monthly taxi-out delay by airport per year for over 200 airports.	1995 to present	ASQP and APO-130
TOSUMYY	Performance	Yearly taxi-out timetable (under development).	1999	ASQP

Table A-1. PMAC Database Files (Cont'd)

Filename	Category		Time	Source(s)
TTIMYYMM	Performance	Turnaround time by carrier, aircraft type. Presented by percentile based on tail numbers. ***Enhancement #13***	2001 to present	ASPM
WX_APT	Weather	302 airports that have processed hourly surface observations.	1995 to 1998	NCDC
WX_APTSAV3	Weather	494 airports that have processed hourly surface observations beginning in 1999.	1999 to present	NCDC
WXCATYY	Weather	All CAT I/II/III observations (ceiling <200 ft or vsby<1/2 mile) for 1995 through present.	1995 to present	NCDC Surface Ops
WXCODES	Weather	All manual observation codes reported in the present weather fields of the hourly surface data with special reports (observations within a given hour).	1999 – DATSAV3	NCDC Manual Weather Codes
WXCODESA	Weather	Same as WXCODES, but automated observation codes.	1999 – DATSAV3	NCDC Manual Weather Codes
WXTSTMYY.DBF	Weather	All weather observations containing a thunderstorm code 17,29, and/or 95-99 in the Pres_WW-Pres_WW3 fields and the duration of each thunderstorm. ***Enhancement #12***	1999 to present	NCDC Surface Ops
WXDYYAPT	Weather/Delay/ Disruptions	Annual weather/delay/disruptions data grouped by airport and weather condition. ***Enhancement #11***	1999 to present	ASQP and NCDC Surface Ops
WXDYYAMO	Weather/Delay/ Disruptions	Annual weather/delay/disruptions data grouped by airport, month, and weather condition. ***Enhancement #11***	1999 to present	ASQP and NCDC Surface Ops
WXDYYMO	Weather/Delay/ Disruptions	Annual weather/delay/disruptions data grouped by month and weather condition. ***Enhancement #11***	1999 to present	ASQP and NCDC Surface Ops
WXDYYSUM	Weather/Delay/ Disruptions	Annual weather/delay/disruptions data grouped by weather condition. ***Enhancement #11***	1999 to present	ASQP and NCDC Surface Ops
WXTOT_YY or WX98_99TOT	Weather	Annual file containing all months from WXYYMM files.	1995 to present	NCDC Surface Ops
WXYYMM	Weather	All observed hourly observations for approx. 300-400+ airports with reported ceiling/vsby, wind attributes, precipitation, etc. ***Additional fields, Enhancement #2***	1995 to present	NCDC Surface Ops
WXNPYY	Weather	All non-precision occurrences (typically ceiling <500' or visibility <1 mile from 400+ airports (WX_APTSAV3).	1995 to present	NCDC Surface Ops

Appendix B: Official Airline Guide

The Official Airline Guide (OAG) is a summary of all scheduled flights, both domestic and international. Note: The raw files are not carried forward in PMAC, yet, are accessible within the ORLAB. Flights include all flight segments that are identified through unique flight numbers. The processed OAG data retrievable in PMAC includes all domestic-to-domestic flights, international-to-domestic flights, and domestic-to-international flights. There are several ways for the analyst to access the information either through Structured Query Language (SQL) or the PMAC interface. The summary tables of all of the files derived from the OAG are presented in Appendix A, beginning with OAG*.DBF. The raw OAG files received from APO-130 can be retrieved from the Data\OAG sub-directory on the FTP server. A login and password is required from the ASD-400 network administrator. These files are stored in either WINZIP or DBF format. The file formats are shown below in Tables B-1 and B-2.

Table B-1. OAG Record Description

FIELD	STARTING POSITION	ENDING POSITION	SIZE	FORMAT
LVECODE	1	4	4	NUMERIC
LEAVE	5	9	5	CHARACTER
LVETIME	10	13	4	CHARACTER
LVEGMT	14	17	4	CHARACTER
ARRCODE	18	21	4	NUMERIC
ARRIVE	22	26	5	CHARACTER
ARRTIME	27	30	4	CHARACTER
FLAG	31	31	1	NUMERIC
ARRGMT	32	35	4	CHARACTER
EQUIP	36	39	4	CHARACTER
UPDATE	40	40	1	CHARACTER
FAACARR	41	43	3	CHARACTER
FLTNO	44	48	5	CHARACTER
CLASS	49	52	4	CHARACTER
BLANK	53	53	1	CHARACTER
FREQ	54	60	7	CHARACTER
SUN	54	54	1	NUMERIC
MON	55	55	1	NUMERIC
TUE	56	56	1	NUMERIC
WED	57	57	1	NUMERIC
THU	58	58	1	NUMERIC
FRI	59	59	1	NUMERIC
SAT	60	60	1	NUMERIC
SUPCODE	61	61	1	CHARACTER
TYPEOPER	62	62	1	CHARACTER
ELAPSED	63	66	4	NUMERIC
EDATE	67	70	4	NUMERIC
DDATE	71	74	4	NUMERIC
ATACARR	75	77	3	CHARACTER
SEATS	78	80	3	NUMERIC
DEPLAT	81	86	6	CHARACTER
DEPLONG	87	92	6	CHARACTER
ARRLAT	93	98	6	CHARACTER
ARRLONG	99	104	6	CHARACTER
OAGLVE	105	107	3	CHARACTER
BLANK	108	108	1	CHARACTER

Table B-1. OAG Record Description (Cont'd)

FIELD	STARTING POSITION	ENDING POSITION	SIZE	FORMAT
OAGARR	109	111	3	CHARACTER
BLANK	112	112	1	CHARACTER
OAGCARR	113	114	2	CHARACTER
CARRTYPE	115	115	1	CHARACTER
ATAEQUIP	116	118	2	CHARACTER
EQTYPE	119	119	1	CHARACTER
ARRCITY	120	146	27	CHARACTER
CARRNAME	147	173	27	CHARACTER
ARCENTER	174	176	3	CHARACTER
STAMILES	177	181	5	NUMERIC
LVECITY	182	208	27	CHARACTER
ARRCNTRY	209	235	27	CHARACTER
LVECNTRY	236	262	27	CHARACTER
YYMM[16]	263	266(268)	4(6)	NUMERIC
EDAY	267(269)	298(300)	31	CHARACTER
FPM	299(301)	301(303)	3	NUMERIC

[16] Starting in 2000, this field became 6 characters wide (YYYYMM), shifting the subsequent fields over.

Table B-2. OAG Field Descriptions

Field	Position	Length	Description
Country	1-4	4	Four position numeric code which identifies departure country of this flight. Position 4 is a constant zero. Refer to World Area Code.
Airport Code	5-9	5	FAA Official Airport Location Code Identifiers, with certain exceptions and extensions used by ATA/IATA, left justified.
Local Time	10-13	4	24-hr. local clock time. 2400 and 0000 are invalid. Schedules at such time are entered as 0001. FLAG and FUEL are also valid.
GMT	14-17	4	The same information as in positions 10-13 expressed in Greenwich Mean Time. FLAG and FUEL is also valid.
Country	18-21	4	Four position numeric field which identifies the destination country of this flight. Position 21 is a constant zero.
Airport Code	22-26	5	FAA Official Airport Location Code Identifiers, with certain exceptions and extensions used by ATA/IATA, left justified.
Local Time	27-30	4	24-hour local clock time at the destination airport. 0000 and 2400 are invalid in this field. FLAG and FUEL may be coded to indicate flag or fuel stops.
Flag Code	31	1	0=Any carrier beginning and ending out of the U.S. 1=Domestic Carrier beginning and ending in the U.S. 2=Domestic Carrier. Either departure or arrival but both are not in the U.S.

Table B-2. OAG Field Descriptions (Cont'd)

Field	Position	Length	Description
			3=International Carrier. With both departure and arrival points within the U.S. 4=International Carrier. Either departure or arrival but both are not in the U.S.
GMT	32-35	4	The same information as in positions 27-30 expressed in Greenwich Mean Time. FLAG and FUEL is also valid.
Equipment	36-39	4	FAA provided equipment code describing the type of aircraft. Left justified.
Update	40	1	This code will indicate change records: A=Add C=Change D=Delete " "=No Change
Carrier	41-43	3	FAA provided Code identifying the carrier. If identification code is not or cannot be provided, this field will be filled with 99 left justified.
Flight Number	44-48	5	Normally numeric but may have alphabetic suffix in low order position or a tag ( ) in the low order position to indicate that the number is "unofficial." Right justified, zero filled.
CLASS	49-52	4	
Blank	53-53	1	
Days of Service	54-60	7	Each position indicated will contain a "1" if service is scheduled and a "0" if it is not. The day of the week is based on local time at the point of departure. Pos. Day of Week ---- ----------- 54 Sunday 55 Monday 56 Tuesday 57 Wednesday 58 Thursday 59 Friday 60 Saturday

Table B-2. OAG Field Descriptions (Cont'd)

Field	Position	Length	Description
Suppression Indicator	61	1	1 = Suppressed Flight Blank = Not Suppressed.
Type of Operator	62	1	T = Commuter Air Carrier or scheduled Air Taxi. I = Intre-State. Blank = Scheduled air carrier or other.
Elapsed Time	63-66	4	Number of minutes from scheduled departure to arrival of this stage. If any of the "time" fields are not numeric (FLAG or FUEL), this field contains 0001.
Effective Date	67-70	4	67-68 = Month numeric 69-70 = Day of Month
Discontinued Date	71-74	4	71-72 = Month numeric 73-74 = Day of Month Note: If a stage is scheduled throughout the effective period of the file, the above two fields are blank. Otherwise the fields contain the first day of operation, respectively, as applicable.
Carrier	75-77	3	ATA/IATA code identifying the carrier.
Blank	78-80	3	
Departure Airport Latitude	81-86	6	The Departure Latitude expressed in seconds plus 324,000 seconds if latitude is North. If latitude is South, latitude in seconds is subtracted from 324,000.
Departure Airport Longitude	87-92	6	The Departure Longitude expressed in seconds, signed plus if East and minus if West.
Arrival Airport Latitude	93-98	6	This fields is expressed in the same way as the corresponding departure field.
Arrival Airport Longitude	99-104	6	This field is expressed in the same way as the corresponding departure field.

Table B-2. OAG Field Descriptions (Cont'd)

Field	Position	Length	Description
Departure Airport Code	105-107	3	ATA/IATA Departure Airport code.
Blank	108	1	
Arrival Airport Code	109-111	3	ATA/IATA Arrival Airport code.
Blank	112	1	
OAG Carrier Code	113-114	2	OAG Carrier Code.
CarrType	115	1	C = scheduled Commuter A = scheduled Carrier
Equipment Code	116-118	3	ATA/IATA Equipment Designator
Equipment Type	119	1	J = JET P = Propeller T = Turbo Prop
Arrival City	120-146	27	The city name and country separated by a ":". Based on the ARRIVE field.
Carrier Name	147-173	27	Name of the Carrier providing the Service. Based on the OAGCARR field.
Arrival Center	174-176	3	Air traffic control center
Statute Miles	177-181	5	Number of statute miles for associated city pair
Departing City	182-208	27	The city name and country separated by a ":". Based on the LEAVE field.
Arrival Country	209-235	27	Country name based on the ARRIVE field.
Departing Country	236-262	27	Country name based on the LEAVE field.
Year Month[17]	263-266(268)	4(6)	Date for this record
Effective	267-298(269-300)	31	0=no flight on this day of month 1=did fly on this day of month
Flights Per Month	299-301(301-303)	3	Number of flights per month Sum of FPM (pos 267 - pos 298)

[17] Starting in 2000, this field became six characters wide (YYYYMM), shifting the subsequent fields over.

Appendix C: Airline Service Quality Performance

Airline Service Quality Performance (ASQP) data are collected by DOT under authority of 14 Code Federal Regulations (CFR), part 234. Any airline with more than 1 percent of domestic enplanements is required to report to DOT. All 10 of the reporting carriers (12 carriers began reporting in 2001) have more than 1 percent of the domestic enplanements. In fulfilling DOT's data reporting requirements, the reporting air carriers use automated and/or manual systems for collecting the flight data. Based on the most recent information in 2001, of the 12 reporting carriers, American, Northwest, United, and US Airways use ACARS exclusively; Continental, American Eagle, Delta, and Trans World Airlines use a combination of ACARS and manual reporting systems; and America West, Aloha, Southwest, and Alaska Airlines rely solely on their pilots, gate agents and/or ground crews to record arrival times manually. Listed below (Table C-1) is the record layout for the ASQP data. It is provided monthly by DOT, the Bureau of Transportation Statistics (BTS) to ASD-400 in raw format. There is approximately a 3-4 week lag from the end of the month in the delivery to ASD-400, i.e., October data will be delivered in the 3rd to 4th week of November.

Table C-1. ASQP Database Files

Fld No.	Data Item	Type	Comments
1	**Carrier Code**	Character	Official IATA Data
2	**Flight Number**	Numeric	Value Range 0001-9999
3	**Departure Airport**	Character	
4	**Arrival Airport**	Character	
5	**Century**	Numeric	
6	**Year**	Numeric	
7	**Month**	Numeric	
8	**Date of Operation**	Numeric	
9	**Day of Week Indicator**	Numeric	
10	**OAG Departure Time**	Character	Format: HHMM
11	**CRS Departure Time**	Character	" "
12	**Actual Departure Time**	Character	" "
13	**OAG Arrival Time**	Character	" "
14	**CRS Arrival Time**	Character	" "
15	**Actual Arrival Time**	Character	" "
16	**OAG-CRS Dep. Delay**	Numeric	In Minutes
17	**OAG-CRS Arrival Delay**	Numeric	" "
18	CRS Elapsed Time – G2G	Numeric	" "
19	Actual Elapsed Time – G2G	Numeric	" "
20	**Actual Departure Delay**	Numeric	" "
21	**Actual Arrival Delay**	Numeric	" "
22	**Actual - CRS Elapsed Time Diff**	Numeric	
23	Wheels-Off Time	Character	Format: HHMM
24	Wheels-On Time	Character	" "
25	Tail Number	Character	
26	**Taxi-Out Minutes**	Numeric	In Minutes
27	**Taxi-In Minutes**	Numeric	" "
28	**Airborne Minutes**	Numeric	" "

* Bolded columns indicate what is directly retrievable from the Delay Section in Module 2.

** All raw ASQP files reside in F:/DATA directory. 28 fields, with the addition of fields 5, 6, and 7, became effective May 2000, due to Y2K adjustments; prior to that there were 25 fields.

Appendix D: Consolidated Operations Delay Analysis System

The Consolidated Operations Delay Analysis System (CODAS) was developed by the Office of Aviation Policy and Plans (APO-130) to provide delays on a flight specific basis. CODAS combines data from several existing sources including the ASQP, OAG, and ETMS. CODAS calculates delays by both total flight delay and phase of flight. Individual flights are broken down into four sequential segments: gate delay, taxi-out delay, airborne delay, and taxi-in delay.

The following record layout from APO-130 (Table D-1) reflects the last update of February 17, 1999. Several fields from the raw files are presented in Julian seconds and GMT. They are OAG_S_DEP, OAG_S_ARR, CRS_DEP, ASQP_DEP, FILED_PTIM, PLAN_OFF, PLAN_ON, EDCT_OFF, ACT_DZ, ACT_AZ, WHEELS_OFF, and WHEELS_ON. The data is later converted into local times.

Table D-1. CODAS Database Files

Field Name	Type/Size	Description
FAACARRIER	C3	FAA Carrier code from ETMS or ASQP; NA if GA or Military
FLTNO	N4	Numeric part of flight number from ETMS or ASQP for Air Carrier only, 0 for other user_classes
USER_CLASS	C1	Air Carrier (C), Air Taxi (T), Military (M), GA (G), Freight (F) and Unknown (?). If from ASQP, always C
ASQP	C1	ASQP record found flag
ETMS	C1	ETMS record found flag
OAG	C1	OAG record found flag. Note, if both ASQP and ETMS, then OAG is not used
TAILNO	C6	Aircraft tail number from ASQP or for non-ASQP flights parsed from ETMS carrier/flight number, or ? when unknown
SEGMENT_NO	N2	Flight segment number, -1 if unknown
FLT_TYPE	C1	International Departure (D), International Arrival (A) or Domestic (N) - derived by examining length and leading character of airport locids in ETMS RT message
DEP_LOCID	C4	FAA Location Identifier
ARR_LOCID	C4	FAA Location Identifier
YYMMDD	C6	UTC day of flight departure
OAG_S_DEP	N9	OAG Scheduled gate departure GMT time (in seconds) from ASQP
e_oag_dep	C1	Blank - as defined A - from OAG Match, no ASQP B - from ETMS FILED_P_TIME Y - missing, no OAG match Z - ASQP present, but missing
OAG_S_ARR	N9	OAG Scheduled gate arrival GMT time (in seconds) from ASQP
e_oag_arr	C1	Blank - as defined A - from OAG Match, no ASQP B - computed from ETMS as FILED_P_TIME + NOM_TO (unimpeded TO) +FILED_ETE +NOM_TI.(unimpeded TI) Y - missing, no OAG match Z - ASQP present, but missing
OAG_S_G2G	N3	OAG scheduled gate-to-gate time (in minutes) from ASQP
e_oag_g2g	C1	Blank - as defined A - from OAG Match, no ASQP B - as defined, but reflects estimated OAG DEP or ARR X - missing, out of range (0-999) Y - missing, no OAG match Z - ASQP present, but missing
CRS_DEP	N9	From Computer Reservation System (CRS) scheduled departure time from ASQP

Table D-1. CODAS Database Files (Cont'd)

Field Name	Type/Size	Description
e_crs_dep	C1	Blank - as defined A - equals OAG_DEP if missing Z - missing
CRS_ARR	N9	CRS scheduled arrival time from ASQP
e_crs_arr	C1	Blank - as defined A - from OAG_ARR Z - missing
CRS_G2G	N3	CRS_ARR – CRS_DEP from ASQP
e_crs_g2g	C1	Blank - as defined A - as defined, but reflects estimated CRS DEP or ARR Z - missing
ASQP_DEP	N9	ASQP actual GMT gate departure time; based on sensor in aircraft transmitting using ARINC's ACARS
e_asqp_dep	C1	Blank - as defined A - no ASQP = WHEELS_OFF - estimated TAXI_OUT Z - missing
ASQP_ARR	N9	ASQP actual GMT gate arrival time; based on sensor in aircraft transmitting using ARINC's ACARS
e_asqp_arr	C1	Blank - as defined A - no ASQP = WHEELS_ON + TAXI_IN*60 Z - missing
ASQP_G2G	N3	ASQP actual GMT gate-to-gate time in minutes
e_asqp_g2g	C1	Blank - as defined A - as defined, but reflects estimated ASQP DEP or ARR Z - missing
ETMS_EQPT	C4	FAA equipment type from ETMS flight plan (FZ) message (???? if not determined)
EQPT_LS	C1	Coded Large (L) or Small (S) from ETMS, else "?" if not known
FILED_ETE	N3	Carrier filed Estimated Time En route in Minutes from ETMS FZ message
e_filed_et	C1	Blank - as defined A - CRS_G2G – median NOM_TO - median NOM_TI B - PLAN_ETE Z - missing
FILED_PTIM	N9	Carrier filed "P Time" or planned gate departure time from ETMS FZ message
e_filed_pt	C1	Blank - as defined A - Equals CRS_DEP if ETMS missing B - No ETMS ptime & no ASQP; use ETMS plan_off - nom. Taxi-out Y - No ETMS. Value is ASQP Z - No ETMS; no replacement
PLAN_OFF	N9	FAA planned wheels-off GMT time from ETMS FZ or RT
e_plan_off	C1	Blank - as defined A - Equals CRS_DEP +median NOM_TO Z - missing
PLAN_ON	N9	FAA planned wheels-on GMT time from ETMS FZ or RT
e_plan_on	C1	Blank - as defined A - FILED_ETE + PLAN_OFF Z - missing
PLAN_ETE	N3	FAA planned flight time in minutes = ON - OFF
e_plan_ete	C1	Blank - as defined A - reflects estimated ON or OFF Z - missing or out of range
EDCT_OFF	N9	Controlled wheels-off time from ETMS CDT EDCT RT
ACT_DZ	N9	Departure time from ETMS DZ message (usually 1 minute after wheels-off)

Table D-1. CODAS Database Files (Cont'd)

Field Name	Type/Size	Description
e_act_dz	C1	Blank - as defined A - No ETMS estimate = WHEELS_OFF + GAP_DZ Y - No ETMS found Z - ETMS found, but no DZ record
ACT_AZ	N9	Arrival time from ETMS AZ message time stamp rather than the time in the message (usually 1 to 3 minutes after wheels-on)
e_act_az	C1	Blank - as defined A - Equals WHEELS_ON - GAP_AZ Y - No ETMS found Z - ETMS found, but no AZ record
ACT_DZ2AZ	N3	DZ to AZ time in minutes
e_act_dz2a	C1	Blank - as defined A - reflects estimated DZ or AZ Y - No ETMS found Z - missing or out of range
WHEELS_OFF	N9	ASQP actual wheels-off time
e_whls_off	C1	Blank - as defined A - if no departure ASQP, estimate = ACT_DZ - GAP_DZ Z - missing or out of range
WHEELS_ON	N9	ASQP actual wheels-on time
e_whls_on		Blank - as defined A - if no arrival ASQP, estimate = ACT_AZ + GAP_AZ Z - missing or out of range
GAP_DZ	N4.1	Time in minutes between wheels-off (ASQP) and DZ message (ETMS)
e_gap_dz	C1	Blank - as defined A - DZ message time estimated due to missing DZ B - GAP_DZ is estimated for non-ASQP flights using median ASQP gaps by airport and time of day. C - Estimated average for overseas locations (Canada, England) Z - missing or out of range
GAP_AZ	N5.1	Time in minutes between AZ message time stamp (ETMS) and wheels-on (ASQP)
e_gap_az	C1	Blank - as defined A - AZ message time estimated due to missing AZ B - GAP_AZ is estimated for non-ASQP flights using median ASQP gaps by airport and time of day C - Estimated average for overseas locations (Canada, England). Z - missing or out of range
TAXI_OUT	N4.1	Gate-out to wheels-off from ASQP
e_taxi_out	C1	Blank - as defined A - estimated for non-ASQP flights from median taxi-out by airport and time of day X - Median value not available
AIRBORNE	N5.1	Wheels-off to wheels-on from ASQP
e_airborne	C1	Blank - as defined A - estimated using ACT_DZ and ACT_AZ and GAP_DZ and GAP_AZ for non-ASQP flights Y - less than filed flight plan value (FILED_ETE).
TAXI_IN	N4.1	Wheels-on to Gate-in
e_taxi_in	C1	Blank - as defined A - estimated for non-ASQP flights from median taxi-in by airport and time of day X - Median value not available
GATE_DELAY	N5.1	Minutes of gate delay = ASQP_DEP - FILED_P_TIME if > 0

Table D-1. CODAS Database Files (Cont'd)

Field Name	Type/Size	Description
e_gate_del	C1	Blank - as defined A - if OAG, ASQP_DEP - OAG_DEP B - Early (less than 0, set to 0) Y - out of range (negative) Z - missing
ATA_GATE_H	N5.1	Average minutes of ATC caused gate hold for the airport this month as reported to ATA by airlines
E_GATE_HLD	N5.1	Estimated gate hold using gate delay, EDCT_HOLD and ATA reported averages (EDCT_HOLD or GATE_HOLD or ATA_GATE_HODE)
EDCT_HOLD	N5.1	Calculated ground delay based on planned vs. controlled time of departure (EDCT_OFF - PLAN_OFF)
e_edct_hld	C1	Blank - as defined Y - ETMS present, but out of range (< 0) Z - No EDCT_OFF
DELAY_TO	N5.1	Taxi-out delay based on NOM_TO
e_delay_to	C1	Blank - as defined Z - missing or out of range
DELAY_AIR	N5.1	Airborne delay based on AIRBORNE – FILED_ETE
e_delay_a	C1	Blank - as defined Y - out of range (negative) Z - missing
DELAY_TI	N5.1	Taxi-in delay based on NOM_TI
e_delay_ti	C1	Blank - as defined Z - missing or out of range
NOM_TO	N4.1	Unimpeded taxi-out in minutes statistically estimated for airport, carrier, and equipment
NOM_TI	N4.1	Unimpeded taxi-in in minutes statistically estimated for airport, carrier, and equipment
FLIGHT_IND	N10	ETMS 5.0 flight index for tracking ETMS messages
D_WSTN	C4	Weather report station LOCID
D_DISTANCE	N3	Distance in miles from airport to weatherstation
D_TIMELAG	N3	Time in minutes between weather report and scheduled departure
D_CEILING	N4	Ceiling height in meters
D_VISIBILE	N6.2	Visibility in statute miles
D_TEMP	N3	Temperature Celsius
D_WND_ANGL	N3	Wind direction: North = 0
D_WND_SPED	N3	Wind speed knotts
D_CONDNS	C10	Weather conditions; coded string
AD_WSTN	N3	Arrival airport station LOCID at scheduled time of departure
AD_DISTANCE	N3	Distance in miles between weatherstation and arrival airport
AD_TIMELAG	N3	Time between arrival standard report and schedule departure
AD_CEILING	N4	Ceiling height at arrival airport on departure
AD_VISIBIL	N6.2	Visibility at arrival airport on departure
AD_TEMP	N3	Temperature at arrival airport on departure in Celsius
AD_WND_ANG	N3	Wind direction at arrival airport on departure
AD_WND_SPE	N3	Wind speed at arrival airport on departure
AD_CONDNS	C4	Weather conditions at arrival airport on departure
A_WSTN	N3	Arrival airport station LOCID
A_DISTANCE	N3	Distance in miles between weatherstation and arrival airport
A_TIMELAG	N4	Time between weather report and scheduled arrival
A_CEILING	N6.2	Ceiling height in meters

Table D-1. CODAS Database Files (Cont'd)

Field Name	Type/Size	Description
A_VISIBLE	N3	Visibility in miles
A_TEMP	N3	Temperature Celsius
A_WND_ANGL	N3	Wind direction: North = 0
A_WND_SPED	N3	Wind speed knots
A_CONDNS	C10	Weather conditions; coded string
DIF_DEPF		ASQP_DEP - FILED_PTIM
DIF_DEPO		ASQP_DEP - OAG_S_DEP
DIF_DEPC		ASQP_DEP - CRS_DEP
DIF_TO		TAXI_OUT - NOM_TO
DIF_AIR		AIRBORNE - FILED_ETE
DIF_TI		TAXI_IN - NOM_TI
DIF_G2G		ASQP_G2G - OAG_S_G2G
DIF_ARR		ASQP_ARR - OAG_S_ARR
D_OAG_S_DEP T_OAG_S_DEP D_OAG_S_ARR T_OAG_S_ARR D_CRS_S_DEP T_CRS_S_DEP D_CRS_S_ARR T_CRS_S_ARR D_ASQP_DEP T_ASQP_DEP D_ASQP_ARR T_ASQP_ARR D_FIL_PTIM T_FIL_PTIM D_PLAN_OFF T_PLAN_OFF D_PLAN_ON T_PLAN_ON D_EDCT_OFF T_EDCT_OFF D_ACT_DZ T_ACT_DZ D_ACT_AZ T_ACT_AZ D_WHLS_OFF T_WHLS_OFF D_WHLS_ON T_WHLS_ON		These are all Text versions of the local date (D_) and local time (T_) for most of the fields that record time in seconds since 1-1-80 00:00). These fields are for visual convenience and are used on most reports that show local times.
DEL_TOTAL		Total Flight Delay = E_GATE_HLD + DELAY_TO + DELAY_AIR + DELAY_TI
DEL_AIR0		Delay Air Flag = 1 if Airborne Delay == 0
DEL_AIR0_5		Delay Air Flag = 1 if Airborne Delay > 0 and < =5
DEL_AIR5_1		Delay Air Flag = 1 if Airborne Delay > 5 and <= 15
DEL_AIR15P		Delay Air Flag = 1 if Airborne Delay > 15

Table D-1. CODAS Database Files (Cont'd)

Field Name	Type/Size	Description
The following fields are used for calculation convenience and/or for building other tables.		
DEP_HR_GMT		GMT Hour of Departure
ARR_HR_GMT		GMT Hour of Arrival
DEP_HR_LOC		Local Hour of Departure
ARR_HR_LOC		Local Hour of Arrival
YYYYMM		4-digit Year and Month
DEP_QTR		Quarter Hour of Departure
ARR_QTR		Quarter Hour of Arrival
EDCT		EDCT Flag, 1= EDCT Hold present
DELAY_ARR		Minutes of Arrival Delay (ASQP_ARR – CRS_ARR)/60, when > 0
DEP_DAY		Local Day of Departure
ARR_DAY		Local Day of Arrival
DEP_MO_LOC		Local Month of Departure
ARR_MO_LOC		Local Month of Arrival
LAST_DAY		Flag for Last Day of Month, 1 if last DOM

Notes: All points in time are GMT times (in seconds) since midnight January 1, 1980.
All duration times are in minutes.

Many fields have 'flag fields' that indicate when a field is estimated or computed from other fields that were estimated. These flag fields often have more than one code to indicate which of several possible estimates was used. The first estimate (coded A) would be preferred over the second (coded B), and so on. Several of these flag fields also have values that show why a number is missing in the final CODAS record. This is generally true of values X, Y, and Z. Missing values are usually indicated as -1, unless a negative value is normally legal for the field, in addition to the flag field (X, Y, and Z). **It is important to omit -1 values and/or check the flag fields when calculating sums, averages, etc.** [18]

[18] Source: Office of Aviation Policy and Plans.

Appendix E: Aviation System Performance Metrics

The Aviation System Performance Metrics (ASPM) data files are created by the Office of Aviation Policy and Plans (APO) to provide metrics by individual flights by phase of flight. APO's main objective is to develop a clear and well-supported methodology to calculate metrics that would be accepted by both government and industry as valid, accurate, and reliable.

ASPM combines data from several existing sources to estimate flight metrics at 49 major airports. ASPM uses data to provide several detailed and accurate metrics. The same data fields in CODAS are in ASPM; however, ASPM now has several additional data fields that offer very useful time stamps for each flight. The record layout of ASPM that was used through June 2002 is presented below in Tale E-1. The data files beginning in January 2001 are downloaded by ASD-400 from the APO intranet web site on a monthly basis.

Table E-1. ASPM Database Files

Rec #	Field Name	Type	Width[19]	Description
1	YYYYMM	Integer	4 (6)	Year and Month
2	DEP_DAY	Integer	4 (2)	Departure Day
3	DEP_HR_LOCAL	Integer	4 (2)	Departure Local Hour
4	DEP_QTR	Integer	4 (1)	Departure Hour Quarter
5	FAACARRIER	Char	3	Flight Identification - Carrier
6	FLTNO	Integer	4	Flight Identification - Flight Number
7	TAILNO	Char	7	Flight Identification - Tail No
8	ETMS_EQPT	Char	4	Flight Identification - FAA Equipment Type
9	DEP_LOCID	Char	4	Flight Identification - Departure Airport
10	ARR_LOCID	Char	4	Flight Identification - Arrival Airport
11	D_OAG_S_DE	Char	49 (10)	Flight Identification - Scheduled Departure Date
12	OOOI	Char	1	Flight Identification - ARINC Present
13	ETMS	Char	1	Flight Identification - ETMS Present
14	OAG	Char	1	Flight Identification - OAG Present
15	T_OAG_S_DE	Char	49 (5)	Departure Information - Scheduled Gate-Out
16	T_FIL_PTIM	Char	49 (5)	Departure Information - Flight Plan Gate-Out
17	T_OOOI_DEP	Char	49 (5)	Departure Information - Actual Gate-Out
18	T_PLAN_OFF	Char	49 (5)	Departure Information - ETMS Plan Wheels-Off
19	T_WHLS_OFF	Char	49 (5)	Departure Information - Actual Wheels-Off
20	T_EDCT_OFF	Char	49 (5)	Departure Information - EDCT Wheels-Off
21	T_ACT_DZ	Char	49 (5)	Departure Information - DZ
22	GAP_DZ	Integer	4 (3)	Departure Information - GAP DZ
23	GATE_DELAY	Integer	4 (3)	Departure Information - Gate (Compared to Flight Plan)
24	O_GATE_DEL	Integer	4 (3)	Departure Information - Gate (Compared to Schedule)
25	EDCT_HOLD	Integer	4 (3)	Departure Information - EDCT Departure
26	TAXI_OUT	Integer	4 (3)	Departure Information - Taxi-Out Time
27	NOM_TO	Double	8 (4)	Departure Information - Unimpeded Taxi-Out
28	DELAY_TO	Double	8 (5)	Departure Information - Taxi-Out - Actual Compared to Unimpeded (Minutes Difference)
29	T_PTIM_OFF	Char	49 (5)	Departure Information - Flight Plan Off
30	T_OAG_OFF	Char	49 (5)	Departure Information - Scheduled Off
31	PTM_ARPT_DEP	Integer	4 (3)	Departure Information - Airport Departure (Compared to Flight Plan)

[19] In 2002, there were numerous field width changes. The new width is denoted "()".

Table E-1. ASPM Database Files (Cont'd)

Rec #	Field Name	Type	Width[18]	Description
32	OAG_ARPT_DEP	Integer	4 (3)	Departure Information - Airport Departure (Compared to Schedule)
33	T_OAG_S_AR[18]	Char	49 (5)	Arrival Information - Scheduled Gate-In
34	T_ADJ_OAG_AR[18]	Char	49 (5)	Arrival Information - Flight Plan Gate-In
35	T_OOOI_ARR[18]	Char	49 (5)	Arrival Information - Actual Gate-In
36	OAG_S_G2G	Integer	4 (3)	Arrival Information - Scheduled Block Minutes
37	OOOI_G2G	Integer	4 (3)	Arrival Information - Actual Block Minutes
38	T_EDCT_ON[18]	Char	49 (5)	Arrival Information - EDCT Wheels-On
39	T_WHLS_ON[18]	Char	49 (5)	Arrival Information - Actual Wheels-On
40	EDCT_ARR	Integer	4 (5)	Arrival Information - EDCT Arrival
41	T_ACT_AZ[18]	Char	49 (5)	Arrival Information - AZ
42	GAP_AZ	Integer	4 (3)	Arrival Information - Gap AZ
43	FILED_ETE	Integer	4 (3)	Arrival Information - Estimated En route Time
44	AIRBORNE	Integer	4 (3)	Arrival Information - Actual Airborne
45	DELAY_AIR	Integer	4 (3)	Arrival Information - Airborne - Actual Compared to Flight Plan (Minutes Difference)
46	TAXI_IN	Integer	4 (3)	Arrival Information - Taxi-In Time
47	NOM_TI	Double	8 (4)	Arrival Information - Unimpeded Taxi-In
48	DELAY_TI	Double	8 (5)	Arrival Information - Taxi-In - Actual Compared to Unimpeded (Minutes Difference)
49	DIF_G2G	Integer	4 (3)	Arrival Information - Block - Actual Compared to Flight Plan (Minutes Difference)
50	DELAY_ARR	Integer	4 (3)	Arrival Information - Arrival (Compared to Flight Plan)
51	O_ARR_DEL	Integer	4 (3)	Arrival Information - Arrival (Compared to Schedule)

Effective July 2002, APO changed the preceding file formats to what is illustrated in Table E-2. Note: There are three other ASPM files developed by APO that are available through the APO website.

Table E-2. New Data Format for ASPM Flight Level Files

Date/Period Information					
Number	**Field Name**	**Column Name**	**Type**	**Width**	**Description**
1	**DEP_YYYYMM**	**Dep_YYYYMM**	Numeric	6	**Scheduled Departure Year and Month (Local Date)**
2	**DEP_DAY**	**Dep_DAY**	Numeric	2	**Scheduled Departure Day (Local Day)**
3	**DEP_HOUR**	**Dep_HOUR**	Numeric	2	**Scheduled Departure Hour (Local Hour)**
4	**DEP_QTR**	**Dep_QTR**	Numeric	1	**Scheduled Departure Quarter Hour (Local Qtr)**
5	**ARR_YYYYMM**	**Arr_YYYYMM**	Numeric	6	**Scheduled Arrival Year and Month (Local Date)**
6	**ARR_DAY**	**Arr_DAY**		2	**Scheduled Arrival Day (Local Day)**
7	**ARR_HOUR**	**Arr_HOUR**	Numeric	2	**Scheduled Arrival Hour (Local Hour)**
8	**ARR_QTR**	**Arr_QTR**	Numeric	1	
9	**OFF_YYYYMM**	**Off_YYYYMM**	Numeric	6	**Actual Wheels-Off Year and Month (ASQP/OOOI Off Local Date)**
10	**OFF_DAY**	**Off_DAY**	Numeric	2	**Actual Wheels-Off Day (ASQP/OOOI Off Local Day)**
11	**OFF_HOUR**	**Off_HOUR**	Numeric	2	**Actual Wheels-Off Hour (ASQP/OOOI Off Local Hour)**
12	**OFF_QTR**	**Off_QTR**	Numeric	1	**Actual Wheels-Off Quarter Hour (ASQP/OOOI Off Local Qtr)**
13	**ON_YYYYMM**	**On_YYYYMM**	Numeric	6	**Actual Wheels-On Year and Month (ASQP/OOOI On Local Date)**
14	**ON_DAY**	**On_DAY**	Numeric	2	**Actual Wheels-On Day (ASQP/OOOI On Local Day)**
15	**ON_HOUR**	**On_HOUR**	Numeric	2	**Actual Wheels-On Hour (ASQP/OOOI On Local Hour)**
16	**ON_QTR**	**On_QTR**	Numeric	1	**Actual Wheels-On Quarter Hour (ASQP/OOOI On Local Qtr)**

Table E-2. New Data Format for ASPM Flight Level Files (Cont'd)

Flight Identification					
Number	**Field Name**	**Column Name**	**Type**	**Width**	**Description**
17	**FAACARRIER**	**FAACARRIER**	Character	3	**Flight Carrier Code - ICAO**
18	**FLTNO**	**FLTNO**	Numeric	4	**Flight Number (2385 = 2385A)**
19	**TAILNO**	**TAILNO**	Character	7	**Aircraft Tail Number (from ASQP)**
20	**ETMS_EQPT**	**ETMS_EQPT**	Character	4	**IATA Aircraft Equipment Code from ETMS**
21	**DEP_LOCID**	**Dep_LOCID**	Character	4	**Departure Location Identifier: Domestic = space + 3 character identification code, foreign = ICAO 4 character identification code**
22	**ARR_LOCID**	**Arr_LOCID**	Character	4	**Arrival Location Identifier: Domestic = space + 3 character identification code, foreign = ICAO 4 character identification code**
23	**OOOI**	**OOOI**	Character	1	**ARINC OOOI/ASQP Present? (Y=Yes, N=No)**
24	**ETMS**	**ETMS**	Character	1	**ETMS Present? (Y=Yes, N=No)**
25	**OAG**	**OAG**	Character	1	**OAG Present? (Y=Yes, N=No)**
26	**FLT_TYPE**	**FLTTYPE**	Character	1	**Flight Type:** **D = Both Ends are from US Airports (Domestic)** **F = Foreign Departure Airport and US Arrival Airport**
27	**OAG_ACID**	**OAG_ACID**	Character	7	**Foreign Key to Flight Schedule Data System (FSDS) - Carrier and Fltno links to matching OAG record**
28	**USER_CLASS**	**USER_CLASS**	Character	1	**Aircraft Class:** **C = Commercial** **T = Air Taxi** **F = Freight** **G = General Aviation** **M = Military** **O = Other**

Table E-2. New Data Format for ASPM Flight Level Files (Cont'd)

Departure Information					
Number	Field Name	Column Name	Type	Width	Description
29	OAG_S_DEP	SchOutSec	Numeric	11	Scheduled Gate Departure (GMT Seconds since 1/1/80)
30	T_OAG_S_DE	SchOutTm	Character	5	Scheduled Gate Departure Time (Local) HH:MM
31	FILED_PTIM	FPDepSec	Character	11	Flight Plan Gate Departure GMT Seconds since 1/1/80
32	T_FIL_PTIM	FPDepTm	Character	5	Flight Plan Gate Departure Time HH:MM
33	OOOI_DEP	ActOutSec	Numeric	11	Actual Gate-Out GMT Seconds since 1/1/80
34	T_OOOI_DEP	ActOutTm	Character	5	Actual Gate-Out Time HH:MM
35	NOM_TO	NomTO	Numeric	4	Nominal - G60Unimpeded Taxi-Out Time in Minutes
36	TAXI_OUT	ActTO	Numeric	3	Taxi-Out in Minutes
37	OAG_OFF	SchOffSec	Numeric	11	Scheduled Wheels-Off Seconds since 1/1/80
38	T_OAG_OFF	SchOffTm	Character	5	Scheduled Wheels-Off Time HH:MM
39	PTIM_OFF	FPOffSec	Numeric	11	Flight Plan Wheels-Off Seconds since 1/1/80
40	T_PTIM_OFF	FPOffTm	Character	5	Flight Plan Wheels-Off Time HH:MM
41	PLAN_OFF	ETMSOffSec	Numeric	11	ETMS Plan Wheels-Off GMT Seconds since 1/1/80
42	T_PLAN_OFF	ETMSOffTm	Character	5	ETMS Plan Wheels-Off Time HH:MM
43	EDCT_OFF	EDCTOffSec	Numeric	11	EDCT Wheels-Off GMT Seconds since 1/1/80
44	T_EDCT_OFF	EDCTOffTm	Character	5	EDCT Wheels-Off Time HH:MM
45	WHEELS_OFF	ActOffSec	Numeric	11	Actual Wheels-Off GMT Seconds since 1/1/80
46	T_WHLS_OFF	ActOffTm	Character	5	Actual Wheels-Off Time HH:MM
47	ACT_DZ	DZSec	Numeric	11	ETMS Departure Message GMT Seconds since 1/1/80
48	T_ACT_DZ	DZTm	Character	5	ETMS Departure Message Time HH:MM
49	GAP_DZ	GAPDZ	Numeric	3	Minutes Between Wheels-Off and DZ Message
50	O_GATE_DEL	DlySchOut	Numeric	3	Gate Delay in Minutes (Based on Schedule)
51	GATE_DELAY	DlyFPOut	Numeric	3	Gate Delay in Minutes (flight plan based)
52	EDCT_HOLD	DlyEDCT	Numeric	3	EDCT Hold in Minutes
53	DELAY_TO	DlyTO	Numeric	5	Taxi-Out Delay Minutes
54	OAG_ARPT_DEP	DlySchOff	Numeric	3	Airport Departure Delay Minutes (Based on Schedule)
55		DlyFPOff	Numeric	3	Airport Departure Delay Minutes (Based on Flight Plan)

En route Information					
Number	Field Name	Column Name	Type	Width	Description
56	FILED_ETE	FPETE	Numeric	3	Estimated Minutes En route (Flight Plan)
57	AIRBORNE	ActAir	Numeric	3	Actual Airborne Minutes
58	ACT_DZ2AZ	DZ2AZ	Numeric	3	Minutes between DZ and AZ message Time
59	DELAY_AIR	DlyAir		3	Airborne Delay Minutes (ActAir - FPETE)

Table E-2. New Data Format for ASPM Flight Level Files (Cont'd)

Arrival Information					
Number	**Field Name**	**Column Name**	**Type**		**Description**
60	**ACT_AZ**	**AZSec**	Numeric	11	**ETMS Arrival Message Seconds since 1/1/80**
61	**T_ACT_AZ**	**AZTm**	Character	5	**ETMS Arrival Message Time HH:MM**
62	**GAP_AZ**	**GAPAZ**	Numeric	3	**Minutes between Arrival Message and Wheels On Time**
63	**EDCT_ON**	**EDCTOnSec**	Numeric	11	**Wheels-On GMT Seconds since 1/1/80 (Filed on EDCT)**
64	**T_EDCT_ON**	**EDCTOnTm**	Character	5	**Wheels-On Time HH:MM (Filed on EDCT)**
65	**WHEELS_ON**	**ActOnSec**	Numeric	11	**Actual Wheels-On GMT Seconds since 1/1/80**
66	**T_WHLS_ON**	**ActOnTm**	Character	5	**Actual Wheels-On Time HH:MM**
67	**EDCT_ARR**	**EDCTArrDif**	Numeric	5	**Difference between EDCT Expected and Actual Wheels-On (EDCT Arrival)**
68	**NOM_TI**	**NomTI**	Numeric	4	**Unimpeded Taxi-In Time in Minutes**
69	**TAXI_IN**	**ActTI**	Numeric	3	**Taxi-In Time in Minutes**
70	**OAG_S_G2G**	**SchBlock**	Numeric	3	**Scheduled Block Minutes**
71	**OOOI_G2G**	**ActBlock**	Numeric	3	**Actual Block Minutes**
72	**OAG_S_ARR**	**SchInSec**	Numeric	11	**Scheduled Gate-In GMT Seconds since 1/1/80**
73	**T_OAG_S_AR**	**SchInTm**	Character	5	**Scheduled Gate-In HH:MM**
74	**ADJ_OAG_ARR**	**FPInSec**	Numeric	11	**Flight Plan Gate-In GMT Seconds since 1/1/80**
75	**T_ADJ_OAG_ARR**	**FPInTm**	Character	5	**Flight Plan Gate-In HH:MM**
76	**OOOI_ARR**	**ActInSec**	Character	11	**Actual Gate-In GMT Seconds since 1/1/80**
77	**T_OOOI_ARR**	**ActInTm**	Character	5	**Actual Gate-In Time HH:MM**
78	**DELAY_TI**	**DlyTI**	Numeric	5	**Taxi-In Delay in Minutes (Actual Compared to Unimpeded)**
79	**DIF_G2G**	**DlyBlock**	Numeric	3	**Block Delay Minutes**
80	**O_ARR_DEL**	**DlySchArr**	Numeric	3	**Arrival Delay in Minutes (Compared to Scheduled)**
81	**DELAY_ARR**	**DlyFPArr**	Numeric	3	**Arrival Delay in Minutes (Compared to Flight Plan)**
** Total **			399		

Appendix F: Enhanced Traffic Management System

The Enhanced Traffic Management System (ETMS) receives data from the host computer at the 20 Air Route Traffic Control Centers (ARTCCs). This information includes flight plan (FZ messages), actual target messages (TZ), flight amendment (RT messages), cancellation (RZ messages), departure (DZ messages), boundary crossing (UZ messages), sector assignment status, position updates (AF messages), and arrival data (AZ messages). Table F-1 shows the fields that are used in the AZ, DZ, TZ, and FZ data tables. These four tables are supplied to ASD-400 on an ad-hoc basis by the ATA lab (ATA-200). Note: There are other tables from the ETMS, V7.4 that are not used routinely by ASD-400.

Table F-1. ETMS V7.4 Database Files

Name	Definition	Units	Range/Values	File Type
Acid	Any combination of up to 7 alphanumeric characters designating a valid call sign	Alphanumeric	Combination of up to 4 alphabetic and numeric characters (e.g., B737, MD80, and BE02)	AZ, DZ, TZ, FZ
act_date	Activation date for the flight. That is, the departure date of the flight	GMT (Zulu) date	(e.g., 21-MAR-1998)	AZ, DZ, TZ, FZ
Flight_index	ETMS generated flight identifier; this data element is part of the primary key	Integer	1-999999 (negative or positive)	AZ, DZ, TZ, FZ
Orig_time	Time stamp on the source message	Date and time to the nearest minute	Date and time in DD-MON-YY HH24:MI:SS format (e.g., 28-AUG-96 09:10:16)	AZ, DZ, TZ, FZ
Dep_time	Wheels-up departure time	Date and time to the nearest minute	Date and time in Oracle format	AZ, DZ, FZ
arr_time	Arrival time from most recent flight arrival message (az)	Date and time to the nearest minute	Date and time in Oracle format	AZ, DZ, FZ
Dept_aprt	Departure airport	Combination of letters and/or numbers	Mostly 3 characters for airports and flights within the NAS; for international flights and non-CONUS flights (whether they depart or land within the NAS or not) 4-character identifiers (e.g., SFO, EGLL, CYYT, 2TN2, and LA26)	AZ, DZ, FZ
arr_aprt	Arrival airport from most recent time-data, route, or position message	Combination of letters and/or numbers	Mostly 3 characters for airports and flights within the NAS; for international flights and non-CONUS flights (whether they depart or land within the NAS or not) 4-character identifiers (e.g., SFO, EGLL, CYYT, 2TN2, and LA26)	AZ, DZ, FZ

Table F-1. ETMS Database Files (Cont'd)

Name	Definition	Units	Range/Values	File Type
Acft_type	Authorized aircraft type	Alphanumeric	Combination of up to 4 alphabetic and numeric characters (e.g., B737, MD80, and BE02)	AZ, DZ, FZ
Source_type	Message type that generated the current transaction record	Single character identifier	D,L,E,B,H (D=DZ, L=AZ, E=EDCT, B=5 SETBACK, H=CONTROL CANCEL)	AZ, DZ, FZ
Dep_flag	Denotes whether time is actual, estimated, controlled, proposed, or scheduled	Single character identifier	A,T,C,P,S (A=actual, T=ttm/estimated, C=controlled, P=proposed, S=scheduled	AZ, DZ, FZ
arr_flag	Denotes whether time is actual, estimated, controlled, proposed, or scheduled	Single character identifier	A,T,C,P,S (A=actual, T=ttm/estimated, C=controlled, P=proposed, S=scheduled	AZ, DZ, FZ
Physical_class	Physical_class from most recent time_data or route message	Alphabet	P,J,T (P=piston, J=jet, T=turbo, "=not determined)	AZ, DZ, FZ
User_class	User Class from most recent time_data or route message	Single character identifier	O,T,F,C,G,M,' ' (O=other, T=air taxi, F=cargo, C=commercial, G=general aviation, M=military, ' '=not determined)	AZ, DZ, FZ
Weight_class	Weight class of aircraft, based on wake vortices produced (a wake vortex is a tornado-like disturbance created as an aircraft passes through the air)	Single character identifier	S,L,H (S=small [less than 41,000 lb.(e.g., Cessna 152, Falcon 50)]; L=large [41,000 - 255,000 lb. (e.g., B727, B757, DHC8)]; H=heavy [255,000 lb or more (e.g., B747, DC10)]; '-'=invalid)	AZ, DZ, FZ
Route_flag	Route information indicator; TRUE if FDB has route on flight	Single character identifier	ASCII values of this field are 0, 1	AZ, DZ, TZ
Num_aircraft	Number of aircraft if this is a formation (e.g., number of military aircraft flying in formation)	Single character identifier	1 - 9	AZ, DZ, FZ
Tcas_heavy_flag	TCAS or heavy aircraft indicator if appropriate; if an acft type has gross take off wt of more than 300,000 lbs., it is classified as a heavy acft; by gross take-off wt the B757 is not heavy, but it does create the same amt of turbulence as a heavy aircraft	Single character identifier	T,H,B,B,L (T=TCAS, H=heavy aircraft, B=both TCAS and heavy, F=B757, L=B757 with TCAS (See Air Traffic Control 7110.65 procedures document, section 2-2-6, IFR flight progress data.) (as of 10/7/96, have also seen a value of "M")	AZ, DZ, FZ

Table F-1. ETMS Database Files (Cont'd)

Name	Definition	Units	Range/Values	File Type
acft_equip	A symbol that indicates, for both VFR and IFR operations, the aircraft's radar transponder, DME, or RNAV capability	Single character identifier	A,B,C,D,E,F,G,M,N,P,R,T,U,W,X *(See Table F-2, Aircraft Equipment Suffix table from Air Traffic Control 7110.65 procedures document, section 2, 3-7 aircraft equipment suffix.)*	AZ, DZ, FZ
arr_fix_time	Estimated time the flight will arrive at its arrival fix	Date and time to the nearest minute	Date and time in Oracle format; also may find many values for 1 minute before midnight the same day as the current message time (e.g., 06-OCT-96 23:59:00 arr_fix_time for a message with a orig_time of 06-OCT-96 02:13:26)	AZ, DZ, TZ, FZ
first_message			As of 7/29/97, this field has been empty (i.e., null)	FZ
num_waypoints	Number of waypoints on current route of flight	Integer	The number of positions (i.e., latitude/longitude) along the current flight	FZ
num_sectors	Number of sectors on current route of flight	Integer	The number of sectors the current flight track (e.g., four would be the number associated with the example for sectors); if no sectors are listed, this number is 0 (not null)	FZ
num_fixes	Number of fixes on current route of flight	Integer	The number of fixes the current flight track (e.g., seven would be the number associated with the example for fixes); if no fix list is present, this number is 0 (not null)	FZ
num_airways	Number of airways on current route of flight	Integer	The number of airways the current flight plans to follow (e.g., four would be the number associated with the example for airways list illustrated above)	FZ
num_centers	Number of centers on current route of flight	Integer	1-9; the number of centers the current flight track will pass through (e.g., four would be the number associated with the example for centers illustrated above)	FZ

Table F-1. ETMS Database Files (Cont'd)

Name	Definition	Units	Range/Values	File Type
Waypoints	List of waypoints for current route of flight	Alphanumeric	The positions (i.e., latitude/longitude) planned for the current flight path (e.g., 7112/11031)	FZ
Sectors	List of sectors for current route of flight	A string of characters and blank spaces	A list of sectors for the current flight (e.g., the following would be a list of four sectors: ZLCSL ZLC32 ZLC44 ZLA07); the sector Ids are separated by blank spaces	FZ
Fixes	The list of fixes on the current route of flight	A string of characters and blank spaces	A list of fixes for the current flight (e.g., the following would be a list of seven fixes: HCM PEGBY JIMBE GRUBY OJAAY SABBI IRONS); the fixes are separated by blank spaces	FZ
Airways	Airways the current flight plans to follow	Alphanumeric	List of the airways a flight plans to follow, separated by blank spaces (e.g., JAL421, COA8962, N788CF)	FZ
Centers	List of centers the flight track will pass through	String of alphabetic characters and blank spaces	List of center identifiers that the flight will pass through, each center separated from the next by a blank space (e.g., a flight passing through four centers might look like the following: ZAU ZKC ZME ZHU)	TZ, FZ
field10	The fixes, routes, waypoints that make up the current flights route	Combination of letters and/or numbers, and punctuation characters	A list of airports, airways, and/or fixes for the current flight track (e.g., ORD.RBS.J71.MEM.J35. MCB.V9.MSY/0202S); the fields are separated by periods in a row indicate some omitted entries	FZ

Table F-1. ETMS Database Files (Cont'd)

Name	Definition	Units		File Type
to_flag	Indicates flight is eligible for international over flight fee for service (not an ETMS data field, added to ATA-200 database in ATA-200 lab)	Single character	T, F, G (T=true, the flight is eligible for international over flight fee for service, F=false, the flight is not eligible for international over flight fee for service but within the NAS, G=flight is outside the NAS)	FZ
nrp	Indicates the flight is participating in the National Route Program	Single character	0,1 (0=not participating, 1=participating)	FZ
flight_status	The status of the flight at the time of the current message for that flight	Alphabet	N,S,L,F,A,R,C,D,T,X,M,E, ' ' (N=none, S=scheduled, L=controlled, F=filed, A=active, R=ascending, C=cruising, D=descending, T=completed, X=cancelled, M=decontrolled, E=error, "=not determined)	FZ
dept_center	First ARTCC controlling the aircraft	Letter of the alphabet or number or other character	A-Y (A=ZAB, B=ZBW, C=ZOB, D=ZDV, E=ZAN, F=ZFW, G=ZAU, H=ZHU, I=ZID, J=ZJX, K=ZKC, L=ZLA, M=ZME, N=ZNY, O=ZOA, P=ZMP, Q=ZHN, R=ZMA, S=ZSE, T=ZTL, U=ZLC, V=ZLB, W=ZDC, X=TSC, Y=ZSU, 1=SCT, n=NYT) for the NAS; 0, 2-9 for other centers	FZ
arr_center	Last ARTCC controlling the aircraft	Alphanumeric	A-Y (A=ZAB, B=ZBW, C=ZOB, D=ZDV, E=ZAN, F=ZFW, G=ZAU, H=ZHU, I=ZID, J=ZJX, K=ZKC, L=ZLA, M=ZME, N=ZNY, O=ZOA, P=ZMP, Q=ZHN, R=ZMA, S=ZSE, T=ZTL, U=ZLC, V=ZLB, W=ZDC, X=TSC, Y=ZSU, 1=SCT, n=NYT) for the NAS; 0, 2-9 for other centers	FZ
posit_time	Time at position	Date and time to the nearest minute	Date and time at the location, in the Oracle date format	TZ

Table F-1. ETMS Database Files (Cont'd)

Name	Definition	Units	Range/Values	File Type
cur_lat	Current latitude	Minutes	-5400 - 5400, where negative values are South and positive values are North (e.g., 2359 = 3919N, 81 =012N, -1406 = 2326S)	TZ
cur_lon	Current longitude	Minutes	-1800 to 10800, where negative values are East and positive values are West (e.g., 7208 = 12008E, 5647 = 9407E, -8423 = 14023W, -2093 = 03453W)	TZ
groundspeed	Flight's reported ground speed	Knots (nm/hr)	Speed made good over the ground	TZ, FZ
altitude	Flight's altitude, either actual or assigned	100 feet	0 - 999	TZ, FZ
next_lat	Next latitude	Minutes	-5400 - 5400, where negative values are South and positive values are North (e.g., 2359 = 3919N, 81 =012N, -1406 = 2326S)	TZ, FZ
next_lon	Next longitude	Minutes	-10800 to 10800, where negative values are East and positive values are West (e.g., 7208 = 12008E, 5647 = 9407E, -8423 = 14023W, -2093 = 03453W)	TZ, FZ
Ghost_to_route	Whether flight is ghostable; if no TZ messages are received for a flight for 7 minutes, the ASD symbol changes to a "ghosted" image	Integer	0,1 (0=false, not ghosted; 1=true, ghosted)	TZ, FZ
Altitude_type	Altitude type	Single character identifier	C,T,P,A,W,F,B,M,E,' ' (C=DDdC, T=DDdT, P=OTP/DDd, A=ABV/DDd, W=VFR/DDd, F=CVF/DDd, B=DDdBDDd, M=MDDd, E=MDDdBDDd, ' '=DDd, where capital D's are required, lowercase d's are optional) (also an "O")	TZ, FZ
Arrival_Fix	Name that identifies the arrival fix	Character		FZ
Field_10_size	Size of field 10 (Flight's route)	Integer		FZ

Table F-2. Aircraft Equipment Suffixes

Suffix	Aircraft Equipment Suffixes
	No DME
/X	No transponder
/T	Transponder with no Mode C
/U	Transponder with Mode C
	DME
/D	No transponder
/B	Transponder with no Mode C
/A	Transponder with Mode C
	TACAN Only
/M	No transponder
/N	Transponder with no Mode C
/P	Transponder with Mode C
	Area Navigation (RNAV)
/Y	LORAN, VOR.DME, or INS with no transponder
/C	LORAN, VOR.DME, or INS, transponder with no Mode C
/I	LORAN, VOR.DME, or INS, transponder with Mode C
	Advanced RNAV with Transponder and Mode C (If an aircraft is unable to operate with a transponder and/or Mode C, it will revert to the appropriate code listed above under Area Navigation.)
/E	Flight Management System (FMS) with en route, terminal, and approach capability. Equipment requirements are: 1. Dual FMS which meets the specifications of AC 25-15, Approval of Flight Management Systems in Transport Category Airplanes; AC 20-129, Airworthiness Approval of Vertical Navigation (VNAV) Systems for use in the U.S. NAS and Alaska, AC 20-130A, Airworthiness Approval of Navigation or Flight Management Systems Integrating Multiple Navigation Sensors; or equivalent criteria as approved by Flight Standards. 2. A flight director and autopilot control system capable of following the lateral and vertical FMS flight path. 3. At least dual inertial reference units (IRUs). 4. A database containing the waypoints and speed/altitude constraints for the route and/or procedure to be flown that is loaded automatically into the FMS flight plan. 5. An electronic map. (U.S. and U.S. territories only unless otherwise authorized.)
/F	A single FMS with en route, terminal, and approach capability that meets the equipment requirements of /E, (a) through (d), above.
/G	Global Positioning System (GPS)/Global Navigation Satellite System (GNSS) equipped aircraft with en route and terminal capability
/R	Required Navigational Performance (denotes capability to operate in RNP designated airspace and routes).
/W	Reduced Vertical Separation Minima (RVSM)
/Q	Required Navigation Performance (RNP) and Reduced Vertical Separation Minima (RVSM) (Indicate approval for application of RNP and RVSM separation standards.) It should be noted that /Q is for automation purposes only and will not be filed by system users. FAA processors will convert to combination of /R+/W to =/Q

Tables F-3, 4, 5, and 6 show the format in which ASD-400 receives ETMS data from ATA-200.

Table F-3. DZ Data (departure message)

acid	dep_flag
act_date	arr_flag
flight_index	physical_class
orig_time	user_class
dep_time	weight_class
arr_time	route_flag
dept_aprt	num_aircraft
arr_aprt	tcas_heavy_flag
acft_type	acft_equip
source_type	arr_fix_time

Table F-5. AZ Data (arrival message)

acid	dep_flag
act_date	arr_flag
flight_index	physical_class
orig_time	user_class
dep_time	weight_class
arr_time	route_flag
dept_aprt	num_aircraft
arr_aprt	tcas_heavy_flag
acft_type	acft_equip
source_type	arr_fix_time

Table F-4. FZ Data (flight plan)

acid	arr_flag
act_date	dep_flag
flight_index	physical_class
orig_time	user_class
arr_fix_time	weight_class
dep_time	first_message
arr_time	num_waypoints
groundspeed	num_sectors
altitude	num_fixes
next_lat	num_airways
next_lon	num_centers
field_10_size	waypoints
ghost_to_route	sectors
arrival_fix	fixes
dept_aprt	airways
arr_aprt	centers
acft_type	field10
altitude_type	to_flag
source_type	num_aircraft
flight_status	tcas_heavy_flag
dept_center	acft_equip
arr_center	nrp

Table F-6. TZ Data[20]
(target message, 1-5 minute updates)

acid	altitude
act_date	next_lat
flight_index	next_lon
orig_time	ghost_to_route
posit_time	altitude_type
cur_lat	center
cur_lon	route_flag
groundspeed	arr_fix_time

[20] Starting in 2000, the TZ messages were changed to one-minute updates at the majority of the ARTCCs.

Appendix G: Terminal Area Forecast

The Terminal Area Forecast (TAF) contains historical, current, and forecast data for enplanements, operations, and instrument operations. The data covers over 300 FAA towered airports, 128 Federal contract tower airports, 175 radar approach control facilities, and almost 3,000 non-FAA airports. Data in the TAF are presented on a U.S. government fiscal year basis (i.e., FY01 is October 1, 2000, through September 30, 2001).

The following files (Table G-1) are available to the analyst in PMAC. They reside on the data storage device Tweedledee/PMAC/local_drive – filename TAFMMYY.DBF (i.e., taf1200.dbf).

- **Enplanements** – contains the numbers of passengers on both air carrier and air taxi/commuter flights – filename TAFENP.DBF (i.e., tafenp.dbf)
- **Operations** – includes itinerant operations and local operations for air carriers, air taxis, GA and military flights – filename TAFACE.DBF (i.e., taface.dbf)
- **Instrument operations** – includes a breakdown of all instrument operations by airport – filename IOP_YY.DBF (i.e., iops_00.dbf)

Table G-1. TAF Database Files

Enplanements				
FIELD NO.	**FIELD NAME**	**TYPE**	**WIDTH**	**DESCRIPTION**
1	Loc_id	Char	4	Airport location identifier code
2	Aport_name	Char	42	Airport name
3	Year	Num	4	Year
4	Scenario	Num	3	Scenario
5	Ac	Num	9	Air carrier
6	Commuter	Num	9	Air commuter
7	T_enpl	Num	16	Total enplanements
8	Ann_grow	Num	16	Annual growth
Operations				
FIELD NO.	**FIELD NAME**	**TYPE**	**WIDTH**	**DESCRIPTION**
1	loc_id	Char	4	Airport location identifier code
2	Aport_name	Char	42	Airport name
3	Year	Num	4	Year
4	Scenario	Num	3	Scenario
5	itn_ac	Num	9	Itinerant operation of air carrier
6	itn_at	Num	9	Itinerant operation of air taxi
7	itn_ga	Num	9	Itinerant operation of general aviation
8	itn_mil	Num	9	Itinerant operation of military
9	t_itn	Num	16	Total itinerant operations
10	loc_ga	Num	9	Local GA operations
11	loc_mil	Num	9	Local military operations
12	t_loc	Num	16	Total Local operations

Table G-1. TAF Database Files (Cont'd)

Instrument Operations				
FIELD NO.	**FIELD NAME**	**TYPE**	**WIDTH**	**DESCRIPTION**
1	loc_id	Char	4	Airport location identifier code
2	Scenario	Num	4	Scenario
3	Year	Num	3	Year
4	pri_ac	Num	9	#AC with primary instrument operation
5	pri_at	Num	9	#AT with primary instrument operation
6	pri_ga	Num	9	#GA with primary instrument operation
7	pri_mil	Num	9	#Mil with primary instrument operation
8	sec_ac	Num	9	#AC with secondary instrument operation
9	sec_at	Num	9	#AT with secondary instrument operation
10	sec_ga	Num	9	#GA with secondary instrument operation
11	sec_mil	Num	9	#Mil with secondary instrument operation
12	tot_overs	Num	9	# of over flights

Table G-2 shows the TAF record layout.

Table G-2. TAF Records

FIELD NO.	FIELD NAME	TYPE	WIDTH	DESCRIPTION
1	loc_id	Char	4	Airport location identifier code
2	Region	Char	3	Region
3	aport_name	Char	42	Airport name
4	City	Char	26	City
5	State	Char	2	State
6	fac_type	Num	1	Facility type
7	fac_level	Num	1	Facility level
8	atct_flag	Log	1	Air traffic control tower ?? – often inaccurate
9	iops_noadd	Log	1	Prevents double counting
10	hub_size	Char	1	Hub size
11	Year	Num	4	Year
12	Scenario	Num	3	Scenario
13	Ac	Num	9	Air carrier
14	Commuter	Num	9	Air commuter
15	t_enpl	Num	16	Total enplanements
16	itn_ac	Num	9	Itinerant operation of air carrier
17	itn_at	Num	9	Itinerant operation of air taxi
18	itn_ga	Num	9	Itinerant operation of general aviation
19	itn_mil	Num	9	Itinerant operation of military
20	t_itn	Num	16	Total itinerant operations
21	loc_ga	Num	9	Local GA operations
22	loc_mil	Num	9	Local military operations
23	t_loc	Num	16	Total Local operations

* All raw TAF files reside on the ASD-400 data repository and are available upon request.

Appendix H: National Climatic Data Center Hourly Service Observations

This section presents the field descriptions of both the DATSAV2 (the format through September 1998) and DATSAV3 (the format from October 1998 through present) layouts. Note: Several fields from the raw and raw-intermediate files are not included in the files presented in this table. Consequently, the data filtered into PMAC's primary weather files, the WXYYMM.DBF files, contain only the fields annotated below. The vast majority of the data needs are satisfied through a subset of the fields, which are carried forward in PMAC. Several of the data fields that are in the raw or raw-intermediate data can be either very difficult and tedious to interpret or understand unless experienced meteorologists are available to provide assistance to the analyses. Nevertheless, if there is a need for more in-depth weather impact analysis from the hourly observations, then additional fields (i.e., snow-depth, dew point, dry bulb temperature, etc.) are available by request to ASD-400 in an ASCII text format by accessing the raw and raw-intermediate files. Each field name in the WXYYMM.DBF files (with a short description) is presented below in Table H-1.

Table H-1. Surface Weather Field Descriptions

Field	Data Type	Description	Field. Len.	PMAC[21] - DSAV3	PMAC[22] - DSAV2	DSAV2
Station	C	The surface reporting station from global-station list	6	X	X	X
Airport	C	The airport code	4	X	X	X
Wdate	C	The date of the geophysical point observation	6/8	X	X	X
Wtime	C	The time of the geophysical point observation (local time)	4	X	X	X
Gmt	C	The time of the geophysical point observation (Universal Time Code)	4	X	X	X
Lat	C	The latitude	7	X		
Long	C	The longitude	7	X		
Reporttype or Obtype	C	Code that denotes the type of geophysical surface observation. Codes include 01=synoptic, 02= airways, 03=METAR, 04=AERO, 05=SMARS, 06=automatic, 07=Synoptic–airways merged.	5	X	X	X
Statelev	C	Elevation at the station	5	X	X	X
Stnctl	C	Indicates what organization controls the station: 1=Air Force or Army, 2=Navy Marines or Coast Guard, 3=NOAA, 4=FAA, 5=Other, 9=Missing	1		X	X
*Winddirect	C	The angle measured in a clockwise direction between the north, and direction that wind is blowing - min 001, max 360 angular degrees	3	X	X	X

* Missing or Null data denoted by "-1"

[21] October 1998 to present used updated DATSAV3 format and carried 38 columns forward using YYYYMMDD in wdate.

[22] January 1996 through September 1998 used DATSAV2 with 42 columns, January 1998 through September 1998 with 43 columns, and wdate is in MMDDYY format.

[23] January 1995 through December 1996 used DATSAV2 and carried 24 columns forward.

Table H-1. Surface Weather Field Descriptions (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC[1] - DSAV3	PMAC[2] - DSAV2	DSAV2
Winddirq	C	Denotes quality of observation 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
Windobst	C	Wind observation type code Cecil, N: normal, Q: squall, V: variable, 9=missing	1	X		
*Windspeed	N	Rate of horizontal travel of air past a fixed point - min 0.0 max 90.0 (converted to knots per hour).	9.3	X	X	X
Windspeedq	C	Code that denotes a quality status of a reported wind observation speed rate, observation 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
*Windgust	C	DATSAV2: The rate of speed of a wind gust ranges from 50 to 1,100 (meters per second with a scaling factor of 10). DATSAV3: The rate of speed of a wind gust ranges from 5 to 110 (meters per second).	4	X	X	X
Windgus_Q	C	Quality of windgust code. Codes include 0=no check, 1=good, 2=suspect, 3=erroneous, and 9=missing.	1	X		
Cig		Height of cloud ceiling in meters, conversion from Code 1677 table		X	X	X
*Cigfeet	N	Conversion to feet from meters from Cig record	5.0	X	X	X
*Cigmeter	N	Original reported record - ranges from 0 meters to 22,000 meters, same as CIG in DATSAV2 format	5.0	X	X	X
CeilingQ	C	Denotes a quality status of a reported ceiling height either, 0=no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
*CeilingD	N	Ceiling determination code. Denotes method to determine the ceiling.	1	X		
COR	N	An indicator showing whether observation was retransmitted as a corrected observation, 0=not a corrected report, 1=corrected report, 9=unknown	1			X
*Vsby_Meter	N	Ranges from 0 to 16000 meters (10 miles), null=missing	6	X		
*Vsby	N	Conversion to miles of the vsby_meter record, null=missing	6.3	X		X
Vsbyq	C	Quality of visibility, 0 = no check, 1=good, 2=suspect, 3=erroneous, 9=missing	1	X		
CV		Visibility indicator: 0=non-variable report, 1=variable report, 9=missing or non-airways/METAR observation	4		X	X

* Missing or Null data denoted by "-1"

Table H-1. Surface Weather Field Descriptions (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC[1] - DSAV3	PMAC[2] - DSAV2	DSAV2
Past_TW		Applicable period of time in hours (000-999) covered by reported past weather			X	X
Past_W1 thru W2	N	First and second past weather reports (00-099) 999=missing			X	X
*Pres_WW	C	Manual occurrence identifier – 1st weather reported, reserved for synoptic and AERO reports.	3	X	X	X
*Pres_WW1	C	Manual occurrence identifier – 2nd weather reported, includes METAR reports.	3	X	X	X
*Pres_WW2	C	Manual occurrence identifier – 3rd weather observation reported.	3	X	X	X
*Pres_WW3	C	Manual occurrence identifier – 4th weather observation reported.	3	X	X	X
*Pres_WACC	C	Present weather – automatic atmospheric condition code	3	X		X
Pres_WQCQ through Pres_WQCQ1	C	Quality status of reported weather observations from automated station; 0=no check,1=Good,2=Suspect,3=Erroneous, 9=missing	1	X		
*Precip_RR1 through Precip_RR2	N	The amount of precipitation in inches. Before 12/99, amount in millimeters.	5.3	X	X	
*Precip_TR1 thru TR2; TR3 and TR4 in DATSAV2	N	Time period of precipitation ranging from 0 to 48 hours ending at time of observation, null=missing	2	X	X	
*Precip_RR1 thru RR2; RR3 and RR4 in DATSAV2	N	DATSAV2: Amount of precipitation in tenths of millimeters (e.g., 25.5 mm stored as 255) DATSAV3: Amount of precipitation in millimeters (e.g., 25.5 mm stored as 25.5)	5.3	X	X	
*Precip_C1	N	The quantity of time over which liquid precipitation was measured, 9=missing	3	X		X
Bog_Pre_FR		0= reported amount of precipitation and reported weather agree or 1=precipitation missing or not reported	1		X	
Bog_Pre-RR		Bogus precipitation amount in whole millimeters (0-9998) for a three-hour synoptic period	4		X	
*HAILSI	N	The diameter of the largest hailstone observed (range 0-20 in cm) converted to inches	3	X		
*RVRA	N	The angle as measured in degrees from magnetic north to the runway along which the visibility is observed	3	X		X

* Missing or Null data denoted by "-1"

Table H-1. Surface Weather Field Descriptions (Cont'd)

Field	Data Type	Description	Field. Len.	PMAC[1] - DSAV3	PMAC[2] - DSAV2	PMAC[3] - DSAV2
*RVR_RUN	C	The code that denotes the left, right, or center runway as the one to which the visibility applies, null=missing	3	X		X
*RVR_VLS	N	The dimension of the horiz distance that can be seen along the runway range is 0-5000 in feet, null=missing	5	X		X
DryBulbTemp		Stored in tenths of degrees Kelvin (e.g. 284.4 stored as 2844) 999=missing	4		X	X
DewPtTemp		Same as dry bulb temp description	4		X	X
SeaVLPRSR		Sea level pressure, stored in tenths of millibatrs (e.g., 1012.2 stored as 10122) 99999=missing	5		X	X
Altset		Stored in hundredths of inches (e.g., 29.32 stored as 2932) 999=missing	4		X	X
RVR_RUN or (RUNWAYNUM)		Runway visual range in whole meters (0000-9998) 9999=missing	2/3	X		X
RVR or RVRA		The angle as measured from magnetic north to the runway to which the visibility is observed	3/4	X		X

* Missing or Null data denoted by "-1"